

*Edw. Bark, 1761*  
The SEAMAN's

# Daily Assistant,

BEING

A Short, Easy, and Plain Method

OF KEEPING

A JOURNAL at SEA;

In which are Contain'd

RULES,

SHEWING

How the Allowances for Lee-way, Variation, Heave of the Sea, Set of Currents, &c. are to be made; and to Correct the Dead-Reckoning by an Observation, in all Cases: And also all the TABLES that are any ways necessary for the SEAMAN's Use in keeping a Journal.

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By THOMAS HASELDEN,

Late Teacher of the MATHEMATICKS in the  
ROYAL-NAVY.

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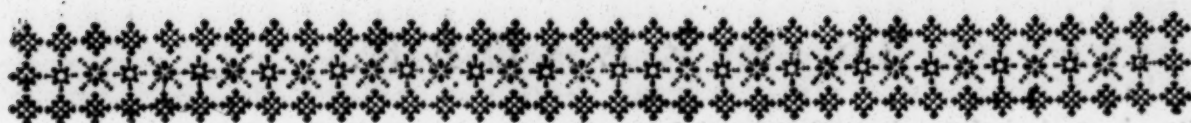
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TO THE  
READER.



*HAVING been Educated in the Theory of Navigation, almost from my Childhood, and having had about Sixteen Years Experience of the Practical part (at Sea) both in the Merchant Service, and also as Teacher of the Mathematicks in the Royal-Navy; and having in the Course of that Time made a general Observation, that there are Numbers of Seamen who would gladly keep a Reckoning, had they any Short, Easy and Plain Method to do it by, but are deterr'd from it by the want of such a Thing: And also that there are many who have thrown their Money away to little or no purpose, by going to School to some Masters (of which sort there are too many) that have only got a Smattering of the Theory, and a few Terms of Art by Rote, which enables them to talk in such a manner as to deceive those that go to learn of them; but having never been at Sea, cannot know any thing of the Practice.*

*Therefore for the Use of such in particular, and of all other Seafaring Men in general, I have Written the following Treatise, in which I think I have inserted all the Rules, and all the Tables with their Uses, that are necessary to be used in any Case at Sea: And also particular Rules for keeping a Journal, with the manner of Correcting the Dead-Reckoning by an Observation, either for one Day, or for a longer Time; the first of which, viz. Correcting for one Day, has been treated of by several Authors; but the latter, viz. Correcting for a longer Time, I know has been barely mentioned in several, but not particularly explain'd in any Author at all I believe, at least in none that I have*

## TO the READER.

*Read; And for that Reason I have done it in the Journal at the latter end of this Book, it being absolutely necessary for every Man that keeps a Reckoning to know it, because they are more likely to be out in their Reckoning, when they have been some Days without an Observation, then when they have one every Day, and consequently more likely to have Occasion to Correct for Three or Four Days, than for a single One.*

*I have not begun this Book with Arithmetic, as most of the Books on this Subject do, because I think, that if any Person has had so little Education as not to be capable of Adding, Subtracting, Multiplying and Dividing, he will hardly be able to make any Progress, either in Arithmetic or Navigation, by the help of Books alone, without the Assistance of a Master (so that I think putting such Things into Books of this kind, serve only to enhance the Price, and are of no Service to the Reader.) And now having given an Account of the Reasons that enduced me to publish this Book (which I hope, and am pretty well assured, will be found the most useful Book of its kind, now in Print) for the Daily-Practice at Sea, I have nothing more to add, but to beg the Readers kind Acceptance of my Endeavours,*

And am,

Their Humble Servant,

Thomas Haselden,

T H E





# T H E C O N T E N T S.

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*Note, All the aforementioned Tables are newly and carefully Calculated, and the Tables of Latitude and Longitude carefully Corrected from the best Authors and Charts.*



A

# TABLE

OF

DIFFERENCE of LATITUDE

AND

# DEPARTURE

To every Single DEGREE,

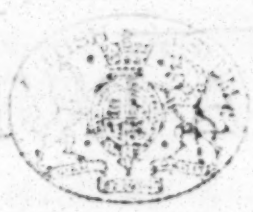
And as far as 300 Miles DISTANCE.





TABLE

DEPT. OF THE INTERIOR



To every State and Territory

And as far as good Miles Distance

# *Difference of Latitude and Departure for 1 Deg.*

I

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.0	51	51.0	00.9	101	101.0	01.8	151	151.0	02.6	201	201.0	03.5	251	251.0	04.3
2	02.0	00.0	52	52.0	00.9	02	102.0	01.8	52	152.0	02.6	02	202.0	03.5	52	252.0	04.3
3	03.0	00.1	53	53.0	00.9	03	103.0	01.8	53	153.0	02.6	03	203.0	03.5	53	253.0	04.3
4	04.0	00.1	54	54.0	00.9	04	104.0	01.8	54	154.0	02.7	04	204.0	03.5	54	254.0	04.4
5	05.0	00.1	55	55.0	01.0	05	105.0	01.8	55	155.0	02.7	05	205.0	03.5	55	255.0	04.4
6	06.0	00.1	56	56.0	01.0	106	106.0	01.8	156	156.0	02.7	206	206.0	03.5	256	256.0	04.4
7	07.0	00.1	57	57.0	01.0	07	107.0	01.9	57	157.0	02.7	07	207.0	03.6	57	257.0	04.4
8	08.0	00.1	58	58.0	01.0	08	108.0	01.9	58	158.0	02.7	08	208.0	03.6	58	258.0	04.4
9	09.0	00.2	59	59.0	01.0	09	109.0	01.9	59	159.0	02.7	09	209.0	03.6	59	259.0	04.4
10	10.0	00.2	60	60.0	01.1	10	110.0	01.9	60	160.0	02.8	10	210.0	03.6	60	260.0	04.5
11	11.0	00.2	61	61.0	01.1	111	111.0	01.9	161	161.0	02.8	211	211.0	03.6	261	261.0	04.5
12	12.0	00.2	62	62.0	01.1	12	112.0	01.9	62	162.0	02.8	12	212.0	03.6	62	262.0	04.5
13	13.0	00.2	63	63.0	01.1	13	113.0	02.0	63	163.0	02.8	13	213.0	03.7	63	263.0	04.5
14	14.0	00.2	64	64.0	01.1	14	114.0	02.0	64	164.0	02.8	14	214.0	03.7	64	264.0	04.5
15	15.0	00.3	65	65.0	01.1	15	115.0	02.0	65	165.0	02.9	15	215.0	03.7	65	265.0	04.6
16	16.0	00.3	66	66.0	01.2	116	116.0	02.0	166	166.0	02.9	216	216.0	03.7	266	266.0	04.6
17	17.0	00.3	67	67.0	01.2	17	117.0	02.0	67	167.0	02.9	17	217.0	03.7	67	267.0	04.6
18	18.0	00.3	68	68.0	01.2	18	118.0	02.1	68	168.0	02.9	18	218.0	03.8	68	268.0	04.6
19	19.0	00.3	69	69.0	01.2	19	119.0	02.1	69	169.0	02.9	19	219.0	03.8	69	269.0	04.6
20	20.0	00.4	70	70.0	01.2	20	120.0	02.1	70	170.0	02.9	20	220.0	03.8	70	270.0	04.6
21	21.0	00.4	71	71.0	01.2	121	121.0	02.1	171	171.0	03.0	221	221.0	03.8	271	271.0	04.7
22	22.0	00.4	72	72.0	01.3	22	122.0	02.1	72	172.0	03.0	22	222.0	03.8	72	272.0	04.7
23	23.0	00.4	73	73.0	01.3	23	123.0	02.1	73	173.0	03.0	23	223.0	03.8	73	273.0	04.7
24	24.0	00.4	74	74.0	01.3	24	124.0	02.2	74	174.0	03.0	24	224.0	03.9	74	274.0	04.7
25	25.0	00.4	75	75.0	01.3	25	125.0	02.2	75	175.0	03.0	25	225.0	03.9	75	275.0	04.7
26	26.0	00.5	76	76.0	01.3	126	126.0	02.2	176	176.0	03.0	226	226.0	03.9	276	276.0	04.7
27	27.0	00.5	77	77.0	01.3	27	127.0	02.2	77	177.0	03.1	27	227.0	03.9	77	277.0	04.8
28	28.0	00.5	78	78.0	01.4	28	128.0	02.2	78	178.0	03.1	28	228.0	03.9	78	278.0	04.8
29	29.0	00.5	79	79.0	01.4	29	129.0	02.2	79	179.0	03.1	29	229.0	03.9	79	279.0	04.8
30	30.0	00.5	80	80.0	01.4	30	130.0	02.3	80	180.0	03.1	30	230.0	04.0	80	280.0	04.8
31	31.0	00.5	81	81.0	01.4	131	131.0	02.3	181	181.0	03.1	231	231.0	04.0	281	281.0	04.8
32	32.0	00.6	82	82.0	01.4	32	132.0	02.3	82	182.0	03.1	32	232.0	04.0	82	282.0	04.8
33	33.0	00.6	83	83.0	01.5	33	133.0	02.3	83	183.0	03.2	33	233.0	04.0	83	283.0	04.9
34	34.0	00.6	84	84.0	01.5	34	134.0	02.3	84	184.0	03.2	34	234.0	04.0	84	284.0	04.9
35	35.0	00.6	85	85.0	01.5	35	135.0	02.3	85	185.0	03.2	35	235.0	04.0	85	285.0	04.9
36	36.0	00.6	86	86.0	01.5	136	136.0	02.4	186	186.0	03.2	236	236.0	04.1	286	286.0	04.9
37	37.0	00.6	87	87.0	01.5	37	137.0	02.4	87	187.0	03.2	37	237.0	04.1	87	287.0	04.9
38	38.0	00.7	88	88.0	01.5	38	138.0	02.4	88	188.0	03.2	38	238.0	04.1	88	288.0	04.9
39	39.0	00.7	89	89.0	01.6	39	139.0	02.4	89	189.0	03.3	39	239.0	04.1	89	289.0	05.0
40	40.0	00.7	90	90.0	01.6	40	140.0	02.4	90	190.0	03.3	40	240.0	04.1	90	290.0	05.0
41	41.0	00.7	91	91.0	01.6	141	141.0	02.4	191	191.0	03.3	241	241.0	04.1	291	291.0	05.0
42	42.0	00.7	92	92.0	01.6	42	142.0	02.5	92	192.0	03.3	42	242.0	04.2	92	292.0	05.0
43	43.0	00.8	93	93.0	01.6	43	143.0	02.5	93	193.0	03.3	43	243.0	04.2	93	293.0	05.0
44	44.0	00.8	94	94.0	01.6	44	144.0	02.5	94	194.0	03.3	44	244.0	04.2	94	294.0	05.0
45	45.0	00.8	95	95.0	01.7	45	145.0	02.5	95	195.0	03.4	45	245.0	04.2	95	295.0	05.1
46	46.0	00.8	96	96.0	01.7	146	146.0	02.5	196	196.0	03.4	246	246.0	04.2	296	296.0	05.1
47	47.0	00.8	97	97.0	01.7	47	147.0	02.5	97	197.0	03.4	47	247.0	04.2	97	297.0	05.1
48	48.0	00.8	98	98.0	01.7	48	148.0	02.6	98	198.0	03.4	48	248.0	04.3	98	298.0	05.1
49	49.0	00.9	99	99.0	01.7	49	149.0	02.6	99	199.0	03.4	49	249.0	04.3	99	299.0	05.1
50	50.0	00.9	100	100.0	01.7	150	150.0	02.6	200	200.0	03.4	250	250.0	04.3	300	300.0	05.1
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

*for 89 Deg.*



## Difference of Latitude and Departure for 2 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.0	51	51.0	01.8	101	100.9	03.5	151	150.9	05.3	201	200.9	07.0	251	250.8	08.8
2	02.0	00.1	52	52.0	01.8	02	101.9	03.6	52	151.9	05.3	02	201.9	07.1	52	251.8	08.8
3	03.0	00.1	53	53.0	01.8	03	102.9	03.6	53	152.9	05.4	03	202.9	07.1	53	252.8	08.9
4	04.0	00.1	54	54.0	01.9	04	103.9	03.6	54	153.9	05.4	04	203.9	07.1	54	253.8	08.9
5	05.0	00.2	55	55.0	01.9	05	104.9	03.7	55	154.9	05.4	05	204.9	07.2	55	254.8	08.9
6	06.0	00.2	56	56.0	02.0	106	105.9	03.7	156	155.9	05.5	206	205.9	07.2	256	255.8	09.0
7	07.0	00.2	57	57.0	02.0	07	106.9	03.7	57	156.9	05.5	07	206.9	07.2	57	256.8	09.0
8	08.0	00.3	58	58.0	02.0	08	107.9	03.8	58	157.9	05.5	08	207.9	07.3	58	257.8	09.0
9	09.0	00.3	59	59.0	02.1	09	108.9	03.8	59	158.9	05.6	09	208.9	07.3	59	258.8	09.1
10	10.0	00.4	60	60.0	02.1	10	109.9	03.9	60	159.9	05.6	10	209.9	07.4	60	259.8	09.1
11	11.0	00.4	61	61.0	02.1	111	110.9	03.9	161	160.9	05.6	211	210.9	07.4	261	260.8	09.1
12	12.0	00.4	62	62.0	02.2	12	111.9	03.9	62	161.9	05.7	12	211.9	07.4	62	261.8	09.2
13	13.0	00.5	63	63.0	02.2	13	112.9	04.0	63	162.9	05.7	13	212.9	07.5	63	262.8	09.2
14	14.0	00.5	64	64.0	02.2	14	113.9	04.0	64	163.9	05.7	14	213.9	07.5	64	263.8	09.2
15	15.0	00.5	65	65.0	02.3	15	114.9	04.0	65	164.9	05.8	15	214.9	07.5	65	264.8	09.3
16	16.0	00.6	66	66.0	02.3	116	115.9	04.1	166	165.9	05.8	216	215.9	07.6	266	265.8	09.3
17	17.0	00.6	67	67.0	02.3	17	116.9	04.1	67	166.9	05.8	17	216.9	07.6	67	266.8	09.3
18	18.0	00.6	68	68.0	02.4	18	117.9	04.1	68	167.9	05.9	18	217.9	07.6	68	267.8	09.4
19	19.0	00.7	69	69.0	02.4	19	118.9	04.2	69	168.9	05.9	19	218.9	07.7	69	268.8	09.4
20	20.0	00.7	70	70.0	02.4	20	119.9	04.2	70	169.9	06.0	20	219.9	07.7	70	269.8	09.5
21	21.0	00.7	71	71.0	02.5	121	120.9	04.2	171	170.9	06.0	221	220.9	07.7	271	270.8	09.5
22	22.0	00.8	72	72.0	02.5	22	121.9	04.3	72	171.9	06.0	22	221.9	07.8	72	271.8	09.5
23	23.0	00.8	73	73.0	02.5	23	122.9	04.3	73	172.9	06.1	23	222.9	07.8	73	272.8	09.6
24	24.0	00.8	74	74.0	02.6	24	123.9	04.3	74	173.9	06.1	24	223.9	07.8	74	273.8	09.6
25	25.0	00.9	75	75.0	02.6	25	124.9	04.4	75	174.9	06.1	25	224.9	07.9	75	274.8	09.6
26	26.0	00.9	76	76.0	02.7	126	125.9	04.4	176	175.9	06.2	226	225.9	07.9	276	275.8	09.7
27	27.0	00.9	77	77.0	02.7	27	126.9	04.4	77	176.9	06.2	27	226.9	07.9	77	276.8	09.7
28	28.0	01.0	78	78.0	02.7	28	127.9	04.5	78	177.9	06.2	28	227.9	08.0	78	277.8	09.7
29	29.0	01.0	79	79.0	02.8	29	128.9	04.5	79	178.9	06.3	29	228.9	08.0	79	278.8	09.8
30	30.0	01.1	80	80.0	02.8	30	129.9	04.6	80	179.9	06.3	30	229.9	08.1	80	279.8	09.8
31	31.0	01.1	81	81.0	02.8	131	130.9	04.6	181	180.9	06.3	231	230.9	08.1	281	280.8	09.8
32	32.0	01.1	82	81.9	02.9	32	131.9	04.6	82	181.9	06.4	32	231.9	08.1	82	281.8	09.9
33	33.0	01.2	83	82.9	02.9	33	132.9	04.7	83	182.9	06.4	33	232.9	08.2	83	282.8	09.9
34	34.0	01.2	84	83.9	02.9	34	133.9	04.7	84	183.9	06.4	34	233.9	08.2	84	283.8	09.9
35	35.0	01.2	85	84.9	03.0	35	134.9	04.7	85	184.9	06.5	35	234.9	08.2	85	284.8	10.0
36	36.0	01.3	86	85.9	03.0	136	135.9	04.8	186	185.9	06.5	236	235.9	08.3	286	285.8	10.0
37	37.0	01.3	87	86.9	03.0	37	136.9	04.8	87	186.9	06.5	37	236.9	08.3	37	286.8	10.0
38	38.0	01.3	88	87.9	03.1	38	137.9	04.8	88	187.9	06.6	38	237.9	08.3	88	287.8	10.1
39	39.0	01.4	89	88.9	03.1	39	138.9	04.9	89	188.9	06.6	39	238.9	08.4	89	288.8	10.1
40	40.0	01.4	90	89.9	03.1	40	139.9	04.9	90	189.9	06.7	40	239.9	08.4	90	289.8	10.2
41	41.0	01.4	91	90.9	03.2	141	140.9	04.9	191	190.9	06.7	241	240.9	08.4	291	290.8	10.2
42	42.0	01.5	92	91.9	03.2	42	141.9	05.0	92	191.9	06.7	42	241.9	08.5	92	291.8	10.2
43	43.0	01.5	93	92.9	03.2	43	142.9	05.0	93	192.9	06.8	43	242.9	08.5	93	292.8	10.3
44	44.0	01.5	94	93.9	03.3	44	143.9	05.0	94	193.9	06.8	44	243.9	08.5	94	293.8	10.3
45	45.0	01.6	95	94.9	03.3	45	144.9	05.1	95	194.9	06.8	45	244.9	08.6	95	294.8	10.3
46	46.0	01.6	96	95.9	03.4	146	145.9	05.1	196	195.9	06.9	246	245.9	08.6	296	295.8	10.4
47	47.0	01.6	97	96.9	03.4	47	146.9	05.1	97	196.9	06.9	47	246.9	08.6	97	296.8	10.4
48	48.0	01.7	98	97.9	03.4	48	147.9	05.2	98	197.9	06.9	48	247.9	08.7	98	297.8	10.4
49	49.0	01.7	99	98.9	03.5	49	148.9	05.2	99	198.9	07.0	49	248.9	08.7	99	298.8	10.5
50	50.0	01.7	100	99.9	03.5	150	149.9	05.3	200	199.9	07.0	250	249.9	08.8	300	299.8	10.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 88 Deg.



# Difference of Latitude and Departure for 3 Deg.

3

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.9	02.7	101	100.9	05.3	151	150.8	07.9	201	200.7	10.5	251	250.6	13.1
2	02.0	00.1	52	51.9	02.7	02	101.9	05.3	52	151.8	08.0	02	201.7	10.6	52	251.6	13.2
3	03.0	00.2	53	52.9	02.8	03	102.9	05.4	53	152.8	08.0	03	202.7	10.6	53	252.6	13.2
4	04.0	00.2	54	53.9	02.8	04	103.9	05.4	54	153.8	08.1	04	203.7	10.7	54	253.6	13.3
5	05.0	00.3	55	54.9	02.9	05	104.9	05.5	55	154.8	08.1	05	204.7	10.7	55	254.6	13.3
6	06.0	00.3	56	55.9	02.9	106	105.9	05.5	156	155.8	08.2	206	205.7	10.8	256	255.6	13.4
7	07.0	00.4	57	56.9	03.0	07	106.9	05.6	57	156.8	08.2	07	206.7	10.8	57	256.6	13.4
8	08.0	00.4	58	57.9	03.0	08	107.8	05.7	58	157.8	08.3	08	207.7	10.9	58	257.6	13.5
9	09.0	00.5	59	58.9	03.1	09	108.8	05.7	59	158.8	08.3	09	208.7	10.9	59	258.6	13.6
10	10.0	00.5	60	59.9	03.1	10	109.8	05.8	60	159.8	08.4	10	209.7	11.0	60	259.6	13.6
11	11.0	00.6	61	60.9	03.2	111	110.8	05.8	161	160.8	08.4	211	210.7	11.0	261	260.6	13.7
12	12.0	00.6	62	61.9	03.2	12	111.8	05.9	62	161.8	08.5	12	211.7	11.1	62	261.6	13.7
13	13.0	00.7	63	62.9	03.3	13	112.8	05.9	63	162.8	08.5	13	212.7	11.1	63	262.6	13.8
14	14.0	00.7	64	63.9	03.3	14	113.8	06.0	64	163.8	08.6	14	213.7	11.2	64	263.6	13.8
15	15.0	00.8	65	64.9	03.4	15	114.8	06.0	65	164.8	08.6	15	214.7	11.2	65	264.6	13.9
16	16.0	00.8	66	65.9	03.5	116	115.8	06.1	166	165.8	08.7	216	215.7	11.3	266	265.6	13.9
17	17.0	00.9	67	66.9	03.5	17	116.8	06.1	67	166.8	08.7	17	216.7	11.4	67	266.6	14.0
18	18.0	00.9	68	67.9	03.6	18	117.8	06.2	68	167.8	08.8	18	217.7	11.4	68	267.6	14.0
19	19.0	01.0	69	68.9	03.6	19	118.8	06.2	69	168.8	08.8	19	218.7	11.5	69	268.6	14.1
20	20.0	01.0	70	69.9	03.7	20	119.8	06.3	70	169.8	08.9	20	219.7	11.5	70	269.6	14.1
21	21.0	01.1	71	70.9	03.7	121	120.8	06.3	171	170.8	09.0	221	220.7	11.6	271	270.6	14.2
22	22.0	01.1	72	71.9	03.8	22	121.8	06.4	72	171.8	09.0	22	221.7	11.6	72	271.6	14.2
23	23.0	01.2	73	72.9	03.8	23	122.8	06.4	73	172.8	09.1	23	222.7	11.7	73	272.6	14.3
24	24.0	01.3	74	73.9	03.9	24	123.8	06.5	74	173.8	09.1	24	223.7	11.7	74	273.6	14.3
25	25.0	01.3	75	74.9	03.9	25	124.8	06.5	75	174.8	09.2	25	224.7	11.8	75	274.6	14.4
26	26.0	01.4	76	75.9	04.0	126	125.8	06.6	176	175.8	09.2	226	225.7	11.8	276	275.6	14.4
27	27.0	01.4	77	76.9	04.0	27	126.8	06.6	77	176.8	09.3	27	226.7	11.9	77	276.6	14.5
28	28.0	01.5	78	77.9	04.1	28	127.8	06.7	78	177.8	09.3	28	227.7	11.9	78	277.6	14.5
29	29.0	01.5	79	78.9	04.1	29	128.8	06.8	79	178.7	09.4	29	228.7	12.0	79	278.6	14.6
30	30.0	01.6	80	79.9	04.2	30	129.8	06.8	80	179.7	09.4	30	229.7	12.0	80	279.6	14.7
31	31.0	01.6	81	80.9	04.2	131	130.8	06.9	181	180.7	09.5	231	230.7	12.1	281	280.6	14.7
32	32.0	01.7	82	81.9	04.3	32	131.8	06.9	82	181.7	09.5	32	231.7	12.1	82	281.6	14.8
33	33.0	01.7	83	82.9	04.3	33	132.8	07.0	83	182.7	09.6	33	232.7	12.2	83	282.6	14.8
34	34.0	01.8	84	83.9	04.4	34	133.8	07.0	84	183.7	09.6	34	233.7	12.2	84	283.6	14.9
35	35.0	01.8	85	84.9	04.4	35	134.8	07.1	85	184.7	09.7	35	234.7	12.3	85	284.6	14.9
36	35.9	01.9	86	85.9	04.5	136	135.8	07.1	186	185.7	09.7	236	235.7	12.3	286	285.6	15.0
37	36.9	01.9	87	86.9	04.6	37	136.8	07.2	87	186.7	09.8	37	236.7	12.4	87	286.6	15.0
38	37.9	02.0	88	87.9	04.6	38	137.8	07.2	88	187.7	09.8	38	237.7	12.5	88	287.6	15.1
39	38.9	02.0	89	88.9	04.7	39	138.8	07.3	89	188.7	09.9	39	238.7	12.5	89	288.6	15.1
40	39.9	02.1	90	89.9	04.7	40	139.8	07.3	90	189.7	09.9	40	239.7	12.6	90	289.6	15.2
41	40.9	02.1	91	90.9	04.8	141	140.8	07.4	191	190.7	10.0	241	240.7	12.6	291	290.6	15.2
42	41.9	02.2	92	91.9	04.8	42	141.8	07.4	92	191.7	10.0	42	241.7	12.7	92	291.6	15.3
43	42.9	02.2	93	92.9	04.9	43	142.8	07.5	93	192.7	10.1	43	242.7	12.7	93	292.6	15.3
44	43.9	02.3	94	93.9	04.9	44	143.8	07.5	94	193.7	10.1	44	243.7	12.8	94	293.6	15.4
45	44.9	02.4	95	94.9	05.0	45	144.8	07.6	95	194.7	10.2	45	244.7	12.8	95	294.6	15.4
46	45.9	02.4	96	95.9	05.0	146	145.8	07.6	196	195.7	10.3	246	245.7	12.9	296	295.6	15.5
47	46.9	02.5	97	96.9	05.1	47	146.8	07.7	97	196.7	10.3	47	246.7	12.9	97	296.6	15.5
48	47.9	02.5	98	97.9	05.1	48	147.8	07.7	98	197.7	10.4	48	247.7	13.0	98	297.6	15.6
49	48.9	02.6	99	98.9	05.2	49	148.8	07.8	99	198.7	10.4	49	248.7	13.0	99	298.6	15.6
50	49.9	02.6	100	99.9	05.2	150	149.8	07.9	200	199.7	10.5	50	249.7	13.1	300	299.6	15.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 87 Deg.

## Difference of Latitude and Departure for 4 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.9	03.6	101	100.8	07.0	151	150.6	10.5	201	200.5	14.0	251	250.4	17.5
2	02.0	00.1	52	51.9	03.6	02	101.8	07.1	52	151.6	10.6	02	201.5	14.1	52	251.4	17.6
3	03.0	00.2	53	52.9	03.7	03	102.8	07.2	53	152.6	10.7	03	202.5	14.1	53	252.4	17.6
4	04.0	00.3	54	53.9	03.8	04	103.8	07.2	54	153.6	10.7	04	203.5	14.2	54	253.4	17.7
5	05.0	00.3	55	54.9	03.8	05	104.7	07.3	55	154.6	10.8	05	204.5	14.3	55	254.4	17.8
6	06.0	00.4	56	55.9	03.9	106	105.7	07.4	156	155.6	10.9	206	205.5	14.4	256	255.4	17.8
7	07.0	00.5	57	56.9	04.0	07	106.7	07.5	57	156.6	10.9	07	206.5	14.4	57	256.4	17.9
8	08.0	00.6	58	57.9	04.0	08	107.7	07.5	58	157.6	11.0	08	207.5	14.5	58	257.4	18.0
9	09.0	00.6	59	58.9	04.1	09	108.7	07.6	59	158.6	11.1	09	208.5	14.6	59	258.4	18.1
10	10.0	00.7	60	59.9	04.2	10	109.7	07.7	60	159.6	11.2	10	209.5	14.6	60	259.4	18.1
11	11.0	00.8	61	60.9	04.3	111	110.7	07.7	161	160.6	11.2	211	210.5	14.7	261	260.4	18.2
12	12.0	00.8	62	61.9	04.3	12	111.7	07.8	62	161.6	11.3	12	211.5	14.8	62	261.4	18.3
13	13.0	00.9	63	62.8	04.4	13	112.7	07.9	63	162.6	11.4	13	212.5	14.8	63	262.4	18.3
14	14.0	01.0	64	63.8	04.5	14	113.7	07.9	64	163.6	11.4	14	213.5	14.9	64	263.4	18.4
15	15.0	01.0	65	64.8	04.5	15	114.7	08.0	65	164.6	11.5	15	214.5	15.0	65	264.4	18.5
16	16.0	01.1	66	65.8	04.6	116	115.7	08.1	166	165.6	11.6	216	215.5	15.1	266	265.4	18.5
17	17.0	01.2	67	66.8	04.7	17	116.7	08.2	67	166.6	11.6	17	216.5	15.1	67	266.4	18.6
18	18.0	01.3	68	67.8	04.7	18	117.7	08.2	68	167.6	11.7	18	217.5	15.2	68	267.4	18.7
19	19.0	01.3	69	68.8	04.8	19	118.7	08.3	69	168.6	11.8	19	218.5	15.3	69	268.4	18.7
20	20.0	01.4	70	69.8	04.9	20	119.7	08.4	70	169.6	11.8	20	219.5	15.3	70	269.4	18.8
21	20.9	01.5	71	70.8	05.0	121	120.7	08.4	171	170.6	11.9	221	220.5	15.4	271	270.3	18.9
22	21.9	01.5	72	71.8	05.0	22	121.7	08.5	72	171.6	12.0	22	221.5	15.5	72	271.3	19.0
23	22.9	01.6	73	72.8	05.1	23	122.7	08.6	73	172.6	12.1	23	222.5	15.5	73	272.3	19.0
24	23.9	01.7	74	73.8	05.2	24	123.7	08.6	74	173.6	12.1	24	223.5	15.6	74	273.3	19.1
25	24.9	01.7	75	74.8	05.2	25	124.7	08.7	75	174.6	12.2	25	224.5	15.7	75	274.3	19.2
26	25.9	01.8	76	75.8	05.3	126	125.7	08.8	176	175.6	12.3	226	225.5	15.8	276	275.3	19.2
27	26.9	01.9	77	76.8	05.4	27	126.7	08.9	77	176.6	12.3	27	226.5	15.8	77	276.3	19.3
28	27.9	02.0	78	77.8	05.4	28	127.7	08.9	78	177.6	12.4	28	227.5	15.9	78	277.3	19.4
29	28.9	02.0	79	78.8	05.5	29	128.7	09.0	79	178.6	12.5	29	228.5	16.0	79	278.3	19.4
30	29.9	02.1	80	79.8	05.6	30	129.7	09.1	80	179.6	12.5	30	229.4	16.0	80	279.3	19.5
31	30.9	02.2	81	80.8	05.7	131	130.7	09.1	181	180.6	12.6	231	230.4	16.1	281	280.3	19.6
32	31.9	02.2	82	81.8	05.7	32	131.7	09.2	82	181.6	12.7	32	231.4	16.2	82	281.3	19.7
33	32.9	02.3	83	82.8	05.8	33	132.7	09.3	83	182.6	12.8	33	232.4	16.2	83	282.3	19.7
34	33.9	02.4	84	83.8	05.9	34	133.7	09.3	84	183.6	12.8	34	233.4	16.3	84	283.3	19.8
35	34.9	02.4	85	84.8	05.9	35	134.7	09.4	85	184.6	12.9	35	234.4	16.4	85	284.3	19.9
36	35.9	02.5	86	85.8	06.0	136	135.7	09.5	186	185.6	13.0	236	235.4	16.4	286	285.3	19.9
37	36.9	02.6	87	86.8	06.1	37	136.7	09.5	87	186.6	13.0	37	236.4	16.5	87	286.3	20.0
38	37.9	02.7	88	87.8	06.1	38	137.7	09.6	88	187.5	13.1	38	237.4	16.6	88	287.3	20.1
39	38.9	02.7	89	88.8	06.2	39	138.7	09.7	89	188.5	13.2	39	238.4	16.7	89	288.3	20.1
40	39.9	02.8	90	89.8	06.3	40	139.7	09.8	90	189.5	13.2	40	239.4	16.7	90	289.3	20.2
41	40.9	02.9	91	90.8	06.4	141	140.7	09.8	191	190.5	13.3	241	240.4	16.8	291	290.3	20.3
42	41.9	02.9	92	91.8	06.4	42	141.7	09.9	92	191.5	13.4	42	241.4	16.9	92	291.3	20.4
43	42.9	03.0	93	92.8	06.5	43	142.7	10.0	93	192.5	13.5	43	242.4	16.9	93	292.3	20.4
44	43.9	03.1	94	93.8	06.6	44	143.7	10.0	94	193.5	13.5	44	243.4	17.0	94	293.3	20.5
45	44.9	03.1	95	94.8	06.6	45	144.7	10.1	95	194.5	13.6	45	244.4	17.1	95	294.3	20.6
46	45.9	03.2	96	95.8	06.7	146	145.6	10.2	196	195.5	13.7	246	245.4	17.1	296	295.3	20.6
47	46.9	03.3	97	96.8	06.8	47	146.6	10.2	97	196.5	13.7	47	246.4	17.2	97	296.3	20.7
48	47.9	03.4	98	97.8	06.8	48	147.6	10.3	98	197.5	13.8	48	247.4	17.3	98	297.3	20.8
49	48.9	03.4	99	98.8	06.9	49	148.6	10.4	99	198.5	13.9	49	248.4	17.4	99	298.3	20.8
50	49.9	03.5	100	99.8	07.0	150	149.6	10.5	200	199.5	13.9	250	249.4	17.4	300	299.3	20.9
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 86 Deg.



# Difference of Latitude and Departure for 5 Deg.

5

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.8	04.4	101	100.6	08.8	151	150.4	13.1	201	200.2	17.5	251	250.0	21.8
2	02.0	00.2	52	51.8	04.5	02	101.6	08.9	52	151.4	13.2	02	201.2	17.6	52	251.0	21.9
3	03.0	00.3	53	52.8	04.6	03	102.6	09.0	53	152.4	13.3	03	202.2	17.7	53	252.0	22.0
4	04.0	00.3	54	53.8	04.7	04	103.6	09.0	54	153.4	13.4	04	203.2	17.7	54	253.0	22.1
5	05.0	00.4	55	54.8	04.8	05	104.6	09.1	55	154.4	13.5	05	204.2	17.8	55	254.0	22.2
6	06.0	00.5	56	55.8	04.9	106	105.6	09.2	156	155.4	13.6	206	205.2	17.9	256	255.0	22.3
7	07.0	00.6	57	56.8	05.0	07	106.6	09.3	57	156.4	13.7	07	206.2	18.0	57	256.0	22.4
8	08.0	00.7	58	57.8	05.1	08	107.6	09.4	58	157.4	13.7	08	207.2	18.1	58	257.0	22.4
9	09.0	00.8	59	58.8	05.1	09	108.6	09.5	59	158.4	13.8	09	208.2	18.2	59	258.0	22.5
10	10.0	00.9	60	59.8	05.2	10	109.6	09.6	60	159.4	13.9	10	209.2	18.3	60	259.0	22.6
11	11.0	01.0	61	60.8	05.3	111	110.6	09.7	161	160.4	14.0	211	210.2	18.4	261	260.0	22.7
12	12.0	01.0	62	61.8	05.4	12	111.6	09.7	62	161.4	14.1	12	211.2	18.4	62	261.0	22.8
13	12.9	01.1	63	62.8	05.5	13	112.6	09.8	63	162.4	14.2	13	212.2	18.5	63	262.0	22.9
14	13.9	01.2	64	63.8	05.6	14	113.6	09.9	64	163.4	14.3	14	213.2	18.6	64	263.0	23.0
15	14.9	01.3	65	64.8	05.7	15	114.6	10.0	65	164.4	14.4	15	214.2	18.7	65	264.0	23.1
16	15.9	01.4	66	65.7	05.8	116	115.6	10.1	166	165.4	14.4	216	215.2	18.8	266	265.0	23.1
17	16.9	01.5	67	66.7	05.8	17	116.6	10.2	67	166.4	14.5	17	216.2	18.9	67	266.0	23.2
18	17.9	01.6	68	67.7	05.9	18	117.6	10.3	68	167.4	14.6	18	217.2	19.0	68	267.0	23.3
19	18.9	01.7	69	68.7	06.0	19	118.5	10.4	69	168.4	14.7	19	218.2	19.1	69	268.0	23.4
20	19.9	01.7	70	69.7	06.1	20	119.5	10.4	70	169.4	14.8	20	219.2	19.1	70	269.0	23.5
21	20.9	01.8	71	70.7	06.2	121	120.5	10.5	171	170.4	14.9	221	220.2	19.2	271	270.0	23.6
22	21.9	01.9	72	71.7	06.3	22	121.5	10.6	72	171.3	15.0	22	221.2	19.3	72	271.0	23.7
23	22.9	02.0	73	72.7	06.4	23	122.5	10.7	73	172.3	15.1	23	222.2	19.4	73	272.0	23.8
24	23.9	02.1	74	73.7	06.5	24	123.5	10.8	74	173.3	15.1	24	223.1	19.5	74	273.0	23.8
25	24.9	02.2	75	74.7	06.5	25	124.5	10.9	75	174.3	15.2	25	224.1	19.6	75	274.0	23.9
26	25.9	02.3	76	75.7	06.6	126	125.5	11.0	176	175.3	15.3	226	225.1	19.7	276	275.0	24.0
27	26.9	02.4	77	76.7	06.7	27	126.5	11.0	77	176.3	15.4	27	226.1	19.7	77	275.9	24.1
28	27.9	02.4	78	77.7	06.8	28	127.5	11.1	78	177.3	15.5	28	227.1	19.8	78	276.9	24.2
29	28.9	02.5	79	78.7	06.9	29	128.5	11.2	79	178.3	15.6	29	228.1	19.9	79	277.9	24.3
30	29.9	02.6	80	79.7	07.0	30	129.5	11.3	80	179.3	15.7	30	229.1	20.0	80	278.9	24.4
31	30.9	02.7	81	80.7	07.1	131	130.5	11.4	181	180.3	15.7	231	230.1	20.1	281	279.9	24.4
32	31.9	02.8	82	81.7	07.2	32	131.5	11.5	82	181.3	15.8	32	231.1	20.2	82	280.9	24.5
33	32.9	02.9	83	82.7	07.2	33	132.5	11.6	83	182.3	15.9	33	232.1	20.3	83	281.9	24.6
34	33.9	03.0	84	83.7	07.3	34	133.5	11.7	84	183.3	16.0	34	233.1	20.4	84	282.9	24.7
35	34.9	03.1	85	84.7	07.4	35	134.5	11.7	85	184.3	16.1	35	234.1	20.4	85	283.9	24.8
36	35.9	03.1	86	85.7	07.5	136	135.5	11.8	186	185.3	16.2	236	235.1	20.5	286	284.9	24.9
37	36.9	03.2	87	86.7	07.6	37	136.5	11.9	87	186.3	16.3	37	236.1	20.6	87	285.9	25.0
38	37.9	03.3	88	87.7	07.7	38	137.5	12.0	88	187.3	16.4	38	237.1	20.7	88	286.9	25.1
39	38.9	03.4	89	88.7	07.8	39	138.5	12.1	89	188.3	16.4	39	238.1	20.8	89	287.9	25.1
40	39.8	03.5	90	89.7	07.8	40	139.5	12.2	90	189.3	16.5	40	239.1	20.9	90	288.9	25.2
41	40.8	03.6	91	90.7	07.9	141	140.5	12.3	191	190.3	16.6	241	240.1	21.0	291	289.9	25.3
42	41.8	03.7	92	91.6	08.0	42	141.5	12.4	92	191.3	16.7	42	241.1	21.1	92	290.9	25.4
43	42.8	03.8	93	92.6	08.1	43	142.5	12.4	93	192.3	16.8	43	242.1	21.1	93	291.9	25.5
44	43.8	03.8	94	93.6	08.2	44	143.5	12.5	94	193.3	16.9	44	243.1	21.2	94	292.9	25.6
45	44.8	03.9	95	94.6	08.3	45	144.4	12.6	95	194.3	17.0	45	244.1	21.3	95	293.9	25.7
46	45.8	04.0	96	95.6	08.4	146	145.4	12.7	196	195.3	17.1	246	245.1	21.4	296	294.9	25.8
47	46.8	04.1	97	96.6	08.5	47	146.4	12.8	97	196.3	17.1	47	246.1	21.5	97	295.9	25.8
48	47.8	04.2	98	97.6	08.5	48	147.4	12.9	98	197.2	17.2	48	247.1	21.6	98	296.9	25.9
49	48.8	04.3	99	98.6	08.6	49	148.4	13.0	99	198.2	17.3	49	248.1	21.7	99	297.9	26.0
50	49.8	04.4	100	99.6	08.7	150	149.4	13.1	200	199.2	17.4	250	249.1	21.8	300	298.9	26.1
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 85 Deg.



## Difference of Latitude and Departure for 6 Deg.

Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep
1	01.0	00.1	51	50.7	05.3	101	100.4	10.6	151	150.2	15.8	201	199.9	21.0	251	249.6	26.2
2	02.0	00.2	52	51.7	05.4	02	101.4	10.7	52	151.2	15.9	02	200.9	21.1	52	250.6	26.3
3	03.0	00.3	53	52.7	05.5	03	102.4	10.8	53	152.2	16.0	03	201.9	21.2	53	251.6	26.4
4	04.0	00.4	54	53.7	05.6	04	103.4	10.9	54	153.2	16.1	04	202.9	21.3	54	252.6	26.5
5	05.0	00.5	55	54.7	05.7	05	104.4	11.0	55	154.1	16.2	05	203.9	21.4	55	253.6	26.6
6	06.0	00.6	56	55.7	05.9	106	105.4	11.1	156	155.1	16.3	206	204.9	21.5	256	254.6	26.8
7	07.0	00.7	57	56.7	06.0	07	106.4	11.2	57	156.1	16.4	07	205.9	21.6	57	255.6	26.9
8	08.0	00.8	58	57.7	06.1	08	107.4	11.3	58	157.1	16.5	08	206.9	21.7	58	256.6	27.0
9	08.9	00.9	59	58.7	06.2	09	108.4	11.4	59	158.1	16.6	09	207.9	21.8	59	257.6	27.1
10	09.9	01.0	60	59.7	06.3	10	109.4	11.5	60	159.1	16.7	10	208.8	21.9	60	258.6	27.2
11	10.9	01.1	61	60.7	06.4	111	110.4	11.6	161	160.1	16.8	211	209.8	22.0	261	259.6	27.3
12	11.9	01.3	62	61.7	06.5	12	111.4	11.7	62	161.1	16.9	12	210.8	22.2	62	260.6	27.4
13	12.9	01.4	63	62.7	06.6	13	112.4	11.8	63	162.1	17.0	13	211.8	22.3	63	261.6	27.5
14	13.9	01.5	64	63.6	06.7	14	113.4	11.9	64	163.1	17.1	14	212.8	22.4	64	262.5	27.6
15	14.9	01.6	65	64.6	06.8	15	114.4	12.0	65	164.1	17.2	15	213.8	22.5	65	263.5	27.7
16	15.9	01.7	66	65.6	06.9	116	115.4	12.1	166	165.1	17.3	216	214.8	22.6	266	264.5	27.8
17	16.9	01.8	67	66.6	07.0	17	116.4	12.2	67	166.1	17.5	17	215.8	22.7	67	265.5	27.9
18	17.9	01.9	68	67.6	07.1	18	117.4	12.3	68	167.1	17.6	18	216.8	22.8	68	266.5	28.0
19	18.9	02.0	69	68.6	07.2	19	118.3	12.4	69	168.1	17.7	19	217.8	22.9	69	267.5	28.1
20	19.9	02.1	70	69.6	07.3	20	119.3	12.5	70	169.1	17.8	20	218.8	23.0	70	268.5	28.2
21	20.9	02.2	71	70.6	07.4	121	120.3	12.6	171	170.1	17.9	221	219.8	23.1	271	269.5	28.3
22	21.9	02.3	72	71.6	07.5	22	121.3	12.7	72	171.1	18.0	22	220.8	23.2	72	270.5	28.4
23	22.9	02.4	73	72.6	07.6	23	122.3	12.9	73	172.0	18.1	23	221.8	23.3	73	271.5	28.5
24	23.9	02.5	74	73.6	07.7	24	123.3	13.0	74	173.0	18.2	24	222.8	23.4	74	272.5	28.6
25	24.9	02.6	75	74.6	07.8	25	124.3	13.1	75	174.0	18.3	25	223.8	23.5	75	273.5	28.7
26	25.9	02.7	76	75.6	07.9	126	125.3	13.2	176	175.0	18.4	226	224.8	23.6	276	274.5	28.8
27	26.9	02.8	77	76.6	08.0	27	126.3	13.3	77	176.0	18.5	27	225.8	23.7	77	275.5	28.9
28	27.8	02.9	78	77.6	08.1	28	127.3	13.4	78	177.0	18.6	28	226.7	23.8	78	276.5	29.1
29	28.8	03.0	79	78.6	08.3	29	128.3	13.5	79	178.0	18.7	29	227.7	23.9	79	277.5	29.2
30	29.8	03.1	80	79.6	08.4	30	129.3	13.6	80	179.0	18.8	30	228.7	24.0	80	278.5	29.3
31	30.8	03.2	81	80.6	08.5	131	130.3	13.7	181	180.0	18.9	231	229.7	24.1	281	279.5	29.4
32	31.8	03.3	82	81.5	08.6	32	131.3	13.8	82	181.0	19.0	32	230.7	24.2	82	280.4	29.5
33	32.8	03.4	83	82.5	08.7	33	132.3	13.9	83	182.0	19.1	33	231.7	24.3	83	281.4	29.6
34	33.8	03.6	84	83.5	08.8	34	133.3	14.0	84	183.0	19.2	34	232.7	24.5	84	282.4	29.7
35	34.8	03.7	85	84.5	08.9	35	134.3	14.1	85	184.0	19.3	35	233.7	24.6	85	283.4	29.8
36	35.8	03.8	86	85.5	09.0	136	135.3	14.2	186	185.0	19.4	236	234.7	24.7	286	284.4	29.9
37	36.8	03.9	87	86.5	09.1	37	136.2	14.3	87	186.0	19.5	37	235.7	24.8	87	285.4	30.0
38	37.8	04.0	88	87.5	09.2	38	137.2	14.4	88	187.0	19.6	38	236.7	24.9	88	286.4	30.1
39	38.8	04.1	89	88.5	09.3	39	138.2	14.5	89	188.0	19.8	39	237.7	25.0	89	287.4	30.2
40	39.8	04.2	90	89.5	09.4	40	139.2	14.6	90	189.0	19.9	40	238.7	25.1	90	288.4	30.3
41	40.8	04.3	91	90.5	09.5	141	140.2	14.7	191	189.9	20.0	241	239.7	25.2	291	289.4	30.4
42	41.8	04.4	92	91.5	09.6	42	141.2	14.8	92	190.9	20.1	42	240.7	25.3	92	290.4	30.5
43	42.8	04.5	93	92.5	09.7	43	142.2	14.9	93	191.9	20.2	43	241.7	25.4	93	291.4	30.6
44	43.8	04.6	94	93.5	09.8	44	143.2	15.0	94	192.9	20.3	44	242.7	25.5	94	292.4	30.7
45	44.8	04.7	95	94.5	09.9	45	144.2	15.2	95	193.9	20.4	45	243.7	25.6	95	293.4	30.8
46	45.7	04.8	96	95.5	10.0	146	145.2	15.3	196	194.9	20.5	246	244.6	25.7	296	294.4	30.9
47	46.7	04.9	97	96.5	10.1	47	146.2	15.4	97	195.9	20.6	47	245.6	25.8	97	295.4	31.0
48	47.7	05.0	98	97.5	10.2	48	147.2	15.5	98	196.9	20.7	48	246.6	25.9	98	296.4	31.1
49	48.7	05.1	99	98.5	10.3	49	148.2	15.6	99	197.9	20.8	49	247.6	26.0	99	297.4	31.2
50	49.7	05.2	100	99.5	10.5	150	149.2	15.7	200	198.9	20.9	250	248.6	26.1	300	298.4	31.4
Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat

for 84 Deg.

# Difference of Latitude and Departure for 7 Deg.

7

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.6	06.2	101	100.2	12.3	151	149.9	18.4	201	199.5	24.5	251	249.1	30.6
2	02.0	00.2	52	51.6	06.3	02	101.2	12.4	52	150.9	18.5	02	200.5	24.6	52	250.1	30.7
3	03.0	00.4	53	52.6	06.5	03	102.2	12.5	53	151.9	18.6	03	201.5	24.7	53	251.1	30.8
4	04.0	00.5	54	53.6	06.6	04	103.2	12.7	54	152.8	18.7	04	202.5	24.8	54	252.1	30.9
5	05.0	00.6	55	54.6	06.7	05	104.2	12.8	55	153.8	18.9	05	203.5	25.0	55	253.1	31.0
6	06.0	00.7	56	55.6	06.8	106	105.2	12.9	156	154.8	19.0	206	204.5	25.1	256	254.1	31.2
7	06.9	00.9	57	56.6	06.9	07	106.2	13.0	57	155.8	19.1	07	205.4	25.2	57	255.1	31.3
8	07.9	01.0	58	57.6	07.1	08	107.2	13.1	58	156.8	19.2	08	206.4	25.3	58	256.1	31.4
9	08.9	01.1	59	58.6	07.2	09	108.2	13.3	59	157.8	19.4	09	207.4	25.4	59	257.1	31.5
10	09.9	01.2	60	59.6	07.3	10	109.2	13.4	60	158.8	19.5	10	208.4	25.6	60	258.1	31.7
11	10.9	01.3	61	60.5	07.4	111	110.2	13.5	161	159.8	19.6	211	209.4	25.7	261	259.0	31.8
12	11.9	01.5	62	61.5	07.5	12	111.2	13.6	62	160.8	19.7	12	210.4	25.8	62	260.0	31.9
13	12.9	01.6	63	62.5	07.7	13	112.2	13.8	63	161.8	19.8	13	211.4	25.9	63	261.0	32.0
14	13.9	01.7	64	63.5	07.8	14	113.1	13.9	64	162.8	20.0	14	212.4	26.1	64	262.0	32.1
15	14.9	01.8	65	64.5	07.9	15	114.1	14.0	65	163.8	20.1	15	213.4	26.2	65	263.0	32.3
16	15.9	01.9	66	65.5	08.0	116	115.1	14.1	166	164.8	20.2	216	214.4	26.3	266	264.0	32.4
17	16.9	02.1	67	66.5	08.2	17	116.1	14.2	67	165.7	20.3	17	215.4	26.4	67	265.0	32.5
18	17.9	02.2	68	67.5	08.3	18	117.1	14.4	68	166.7	20.5	18	216.4	26.5	68	266.0	32.6
19	18.9	02.3	69	68.5	08.4	19	118.1	14.5	69	167.7	20.6	19	217.4	26.7	69	267.0	32.8
20	19.9	02.4	70	69.5	08.5	20	119.1	14.6	70	168.7	20.7	20	218.4	26.8	70	268.0	32.9
21	20.8	02.6	71	70.5	08.6	121	120.1	14.7	171	169.7	20.8	221	219.3	26.9	271	269.0	33.0
22	21.8	02.7	72	71.5	08.8	22	121.1	14.9	72	170.7	20.9	22	220.3	27.0	72	270.0	33.1
23	22.8	02.8	73	72.5	08.9	23	122.1	15.0	73	171.7	21.1	23	221.3	27.2	73	271.0	33.2
24	23.8	02.9	74	73.4	09.0	24	123.1	15.1	74	172.7	21.2	24	222.3	27.3	74	271.9	33.4
25	24.8	03.0	75	74.4	09.1	25	124.1	15.2	75	173.7	21.3	25	223.3	27.4	75	272.9	33.5
26	25.8	03.2	76	75.4	09.3	126	125.1	15.3	176	174.7	21.4	226	224.3	27.5	276	273.9	33.6
27	26.8	03.3	77	76.4	09.4	27	126.0	15.5	77	175.7	21.6	27	225.3	27.6	77	274.9	33.7
28	27.8	03.4	78	77.4	09.5	28	127.0	15.6	78	176.7	21.7	28	226.3	27.8	78	275.9	33.9
29	28.8	03.5	79	78.4	09.6	29	128.0	15.7	79	177.7	21.8	29	227.3	27.9	79	276.9	34.0
30	29.8	03.7	80	79.4	09.7	30	129.0	15.8	80	178.7	21.9	30	228.3	28.0	80	277.9	34.1
31	30.8	03.8	81	80.4	09.9	131	130.0	16.0	181	179.6	22.0	231	229.3	28.1	281	278.9	34.2
32	31.8	03.9	82	81.4	10.0	32	131.0	16.1	82	180.6	22.2	32	230.3	28.3	82	279.9	34.3
33	32.8	04.0	83	82.4	10.1	33	132.0	16.2	83	181.6	22.3	33	231.3	28.4	83	280.9	34.5
34	33.7	04.1	84	83.4	10.2	34	133.0	16.3	84	182.6	22.4	34	232.2	28.5	84	281.9	34.6
35	34.7	04.3	85	84.4	10.4	35	134.0	16.4	85	183.6	22.5	35	233.2	28.6	85	282.9	34.7
36	35.7	04.4	86	85.4	10.5	136	135.0	16.6	186	184.6	22.7	236	234.2	28.7	286	283.9	34.8
37	36.7	04.5	87	86.3	10.6	37	136.0	16.7	87	185.6	22.8	37	235.2	28.9	87	284.8	34.9
38	37.7	04.6	88	87.3	10.7	38	137.0	16.8	88	186.6	22.9	38	236.2	29.0	88	285.8	35.1
39	38.7	04.8	89	88.3	10.8	39	138.0	16.9	89	187.6	23.0	39	237.2	29.1	89	286.8	35.2
40	39.9	04.9	90	89.3	11.0	40	139.0	17.1	90	188.6	23.1	40	238.2	29.2	90	287.8	35.3
41	40.7	05.0	91	90.3	11.1	141	139.9	17.2	191	189.6	23.3	241	239.2	29.3	291	288.8	35.4
42	41.7	05.1	92	91.3	11.2	42	140.9	17.3	92	190.6	23.4	42	240.2	29.5	92	289.8	35.5
43	42.7	05.2	93	92.3	11.3	43	141.9	17.4	93	191.6	23.5	43	241.2	29.6	93	290.8	35.7
44	43.7	05.4	94	93.3	11.5	44	142.9	17.5	94	192.5	23.6	44	242.2	29.7	94	291.8	35.8
45	44.7	05.5	95	94.3	11.6	45	143.9	17.7	95	193.5	23.7	45	243.2	29.8	95	292.8	35.9
46	45.7	05.6	96	95.3	11.7	146	144.9	17.8	196	194.5	23.9	246	244.1	29.9	296	293.8	36.0
47	46.6	05.7	97	96.3	11.8	47	145.9	17.9	97	195.5	24.0	47	245.1	30.1	97	294.8	36.2
48	47.6	05.8	98	97.3	11.9	48	146.9	18.0	98	196.5	24.1	48	246.1	30.2	98	295.8	36.3
49	48.6	06.0	99	98.3	12.1	49	147.9	18.1	99	197.5	24.2	49	247.1	30.3	99	296.8	36.4
50	49.6	06.1	100	99.3	12.2	150	148.9	18.5	200	198.5	24.3	250	248.1	30.4	300	297.8	36.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 83 Deg.



# 8 *Difference of Latitude and Departure for 8 Deg.*

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	01.0	00.1	51	50.5	07.1	101	100.0	14.1	151	149.5	21.0	201	199.1	28.0	251	248.6	34.9
2	02.0	00.3	52	51.5	07.2	02	101.0	14.2	52	150.5	21.2	02	200.0	28.1	52	249.6	35.1
3	03.0	00.4	53	52.5	07.4	03	102.0	14.3	53	151.5	21.3	03	201.0	28.3	53	250.5	35.2
4	04.0	00.6	54	53.5	07.5	04	103.0	14.5	54	152.5	21.4	04	202.0	28.4	54	251.5	35.4
5	05.0	00.7	55	54.5	07.7	05	104.0	14.6	55	153.5	21.6	05	203.0	28.5	55	252.5	35.5
6	05.9	00.8	56	55.5	07.8	106	105.0	14.8	156	154.5	21.7	206	204.0	28.7	256	253.5	35.6
7	06.9	01.0	57	56.4	07.9	07	106.0	14.9	57	155.5	21.9	07	205.0	28.8	57	254.5	35.8
8	07.9	01.1	58	57.4	08.1	08	107.0	15.0	58	156.5	22.0	08	206.0	29.0	58	255.5	35.9
9	08.9	01.3	59	58.4	08.2	09	107.9	15.2	59	157.5	22.1	09	207.0	29.1	59	256.5	36.1
10	09.9	01.4	60	59.4	08.4	10	108.9	15.3	60	158.4	22.3	10	208.0	29.2	60	257.5	36.2
11	10.9	01.5	61	60.4	08.5	111	109.9	15.5	161	159.4	22.4	211	209.0	29.4	261	258.5	36.3
12	11.9	01.7	62	61.4	08.6	12	110.9	15.6	62	160.4	22.6	12	209.9	29.5	62	259.5	36.5
13	12.9	01.8	63	62.4	08.8	13	111.9	15.7	63	161.4	22.7	13	210.9	29.6	63	260.4	36.6
14	13.9	01.9	64	63.4	08.9	14	112.9	15.9	64	162.4	22.8	14	211.9	29.8	64	261.4	36.7
15	14.9	02.1	65	64.4	09.0	15	113.9	16.0	65	163.4	23.0	15	212.9	29.9	65	262.4	36.9
16	15.8	02.2	66	65.4	09.2	116	114.9	16.1	166	164.4	23.1	216	213.9	30.1	266	263.4	37.0
17	16.8	02.4	67	66.4	09.3	17	115.9	16.3	67	165.4	23.2	17	214.9	30.2	67	264.4	37.2
18	17.8	02.5	68	67.3	09.5	18	116.9	16.4	68	166.4	23.4	18	215.9	30.3	68	265.4	37.3
19	18.8	02.6	69	68.3	09.6	19	117.8	16.6	69	167.4	23.5	19	216.9	30.5	69	266.4	37.4
20	19.8	02.8	70	69.4	09.7	20	118.8	16.7	70	168.4	23.7	20	217.9	30.6	70	267.4	37.6
21	20.8	02.9	71	70.3	09.9	121	119.8	16.8	171	169.3	23.8	221	218.9	30.8	271	268.4	37.7
22	21.8	03.1	72	71.3	10.0	22	120.8	17.0	72	170.3	23.9	22	219.8	30.9	72	269.4	37.9
23	22.8	03.2	73	72.3	10.2	23	121.8	17.1	73	171.3	24.1	23	220.8	31.0	73	270.4	38.0
24	23.8	03.3	74	73.3	10.3	24	122.8	17.3	74	172.3	24.2	24	221.8	31.2	74	271.3	38.1
25	24.8	03.5	75	74.3	10.4	25	123.8	17.4	75	173.3	24.4	25	222.8	31.3	75	272.3	38.3
26	25.7	03.6	76	75.3	10.6	126	124.8	17.5	176	174.3	24.5	226	223.8	31.5	276	273.3	38.4
27	26.7	03.8	77	76.3	10.7	27	125.8	17.7	77	175.3	24.6	27	224.8	31.6	77	274.3	38.6
28	27.7	03.9	78	77.2	10.9	28	126.8	17.8	78	176.3	24.8	28	225.8	31.7	78	275.3	38.7
29	28.7	04.0	79	78.2	11.0	29	127.7	18.0	79	177.3	24.9	29	226.8	31.9	79	276.3	38.8
30	29.7	04.2	80	79.2	11.1	30	128.7	18.1	80	178.3	25.1	30	227.8	32.0	80	277.3	39.0
31	30.7	04.3	81	80.2	11.3	131	129.7	18.2	181	179.2	25.2	231	228.8	32.2	281	278.3	39.1
32	31.7	04.5	82	81.2	11.4	32	130.7	18.4	82	180.2	25.3	32	229.7	32.3	82	279.3	39.3
33	32.7	04.6	83	82.2	11.6	33	131.7	18.5	83	181.2	25.5	33	230.7	32.4	83	280.3	39.4
34	33.7	04.7	84	83.2	11.7	34	132.7	18.7	84	182.2	25.6	34	231.7	32.6	84	281.2	39.5
35	34.7	04.9	85	84.2	11.8	35	133.7	18.8	85	183.2	25.8	35	232.7	32.7	85	282.2	39.7
36	35.7	05.0	86	85.2	12.0	136	134.7	18.9	186	184.2	25.9	236	233.7	32.9	286	283.2	39.8
37	36.6	05.2	87	86.2	12.1	37	135.7	19.1	87	185.2	26.0	37	234.7	33.0	87	284.2	40.0
38	37.6	05.3	88	87.1	12.2	38	136.7	19.2	88	186.2	26.2	38	235.7	33.1	88	285.2	40.1
39	38.6	05.4	89	88.1	12.4	39	137.7	19.3	89	187.2	26.3	39	236.7	33.3	89	286.2	40.2
40	39.6	05.6	90	89.1	12.5	40	138.6	19.5	90	188.2	26.4	40	237.7	33.4	90	287.2	40.4
41	40.6	05.7	91	90.1	12.7	141	139.6	19.6	191	189.1	26.6	241	238.7	33.5	291	288.2	40.5
42	41.6	05.8	92	91.1	12.8	42	140.6	19.8	92	190.1	26.7	42	239.7	33.7	92	289.2	40.6
43	42.6	06.0	93	92.1	12.9	43	141.6	19.9	93	191.1	26.9	43	240.6	33.8	93	290.2	40.8
44	43.6	06.1	94	93.1	13.1	44	142.6	20.0	94	192.1	27.0	44	241.6	34.0	94	291.1	40.9
45	44.6	06.3	95	94.1	13.2	45	143.6	20.2	95	193.1	27.1	45	242.6	34.1	95	292.1	41.1
46	45.6	06.4	96	95.1	13.4	146	144.6	20.3	196	194.1	27.3	246	243.6	34.2	296	293.1	41.2
47	46.5	06.5	97	96.1	13.5	47	145.6	20.5	97	195.1	27.4	47	244.6	34.4	97	294.1	41.3
48	47.5	06.7	98	97.0	13.6	48	146.6	20.6	98	196.1	27.6	48	245.6	34.5	98	295.1	41.5
49	48.5	06.8	99	98.0	13.8	49	147.6	20.7	99	197.1	27.7	49	246.6	34.7	99	296.1	41.6
50	49.5	07.0	100	99.0	13.9	150	148.5	20.9	200	198.1	27.8	250	247.6	34.8	300	297.1	41.8
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

*for 82 Deg.*



# *Difference of Latitude and Departure for 9 Deg.*

9

Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep
1	01.0	00.2	51	50.4	08.0	101	99.8	15.8	151	149.1	23.6	201	198.5	31.4	251	247.9	39.3
2	02.0	00.3	52	51.4	08.1	02	100.7	16.0	52	150.1	23.8	02	199.5	31.6	52	248.9	39.4
3	03.0	00.5	53	52.3	08.3	03	101.7	16.1	53	151.1	23.9	03	200.5	31.7	53	249.9	39.6
4	04.0	00.6	54	53.3	08.4	04	102.7	16.3	54	152.1	24.1	04	201.5	31.9	54	250.9	39.7
5	04.9	00.8	55	54.3	08.6	05	103.7	16.4	55	153.1	24.2	05	202.5	32.1	55	251.9	39.9
6	05.9	00.9	56	55.3	08.8	106	104.7	16.6	156	154.1	24.4	206	203.5	32.2	256	252.9	40.0
7	06.9	01.1	57	56.3	08.9	07	105.7	16.7	57	155.1	24.6	07	204.5	32.4	57	253.8	40.2
8	07.9	01.3	58	57.3	09.1	08	106.7	16.9	58	156.1	24.7	08	205.4	32.5	58	254.8	40.4
9	08.9	01.4	59	58.3	09.2	09	107.7	17.0	59	157.0	24.9	09	206.4	32.7	59	255.8	40.5
10	09.9	01.6	60	59.3	09.4	10	108.6	17.2	60	158.0	25.0	10	207.4	32.8	60	256.8	40.7
11	10.9	01.7	61	60.2	09.5	111	109.6	17.4	161	159.0	25.2	211	208.4	33.0	261	257.8	40.8
12	11.9	01.9	62	61.2	09.7	12	110.6	17.5	62	160.0	25.3	12	209.4	33.2	62	258.8	41.0
13	12.8	02.0	63	62.2	09.9	13	111.6	17.7	63	161.0	25.5	13	210.4	33.3	63	259.8	41.1
14	13.8	02.2	64	63.2	10.0	14	112.6	17.8	64	162.0	25.6	14	211.4	33.5	64	260.8	41.3
15	14.8	02.3	65	64.2	10.2	15	113.6	18.0	65	163.0	25.8	15	212.4	33.6	65	261.7	41.4
16	15.8	02.5	66	65.2	10.3	116	114.6	18.1	166	164.0	26.0	216	213.3	33.8	266	262.7	41.6
17	16.8	02.7	67	66.2	10.5	17	115.6	18.3	67	164.9	26.1	17	214.3	33.9	67	263.7	41.8
18	17.8	02.8	68	67.2	10.6	18	116.5	18.5	68	165.9	26.3	18	215.3	34.1	68	264.7	41.9
19	18.8	03.0	69	68.2	10.8	19	117.5	18.6	69	166.9	26.4	19	216.3	34.3	69	265.7	42.1
20	19.8	03.1	70	69.1	10.9	20	118.5	18.8	70	167.9	26.6	20	217.3	34.4	70	266.7	42.2
21	20.7	03.3	71	70.1	11.1	21	119.5	18.9	171	168.9	26.7	221	218.3	34.6	271	267.7	42.4
22	21.7	03.4	72	71.1	11.3	22	120.5	19.1	72	169.9	26.9	22	219.3	34.7	72	268.7	42.5
23	22.7	03.6	73	72.1	11.4	23	121.5	19.2	73	170.9	27.1	23	220.3	34.9	73	269.6	42.7
24	23.7	03.8	74	73.1	11.6	24	122.5	19.4	74	171.9	27.2	24	221.2	35.0	74	270.6	42.9
25	24.7	03.9	75	74.1	11.7	25	123.5	19.6	75	172.8	27.4	25	222.2	35.2	75	271.6	43.0
26	25.7	04.1	76	75.1	11.9	26	124.5	19.7	176	173.8	27.5	226	223.2	35.3	276	272.6	43.2
27	26.7	04.2	77	76.1	12.0	27	125.4	19.9	77	174.8	27.7	27	224.2	35.5	77	273.6	43.3
28	27.7	04.4	78	77.0	12.2	28	126.4	20.0	78	175.8	27.8	28	225.2	35.7	78	274.6	43.5
29	28.6	04.5	79	78.0	12.4	29	127.4	20.2	79	176.8	28.0	29	226.2	35.8	79	275.6	43.6
30	29.6	04.7	80	79.0	12.5	30	128.4	20.3	80	177.8	28.2	30	227.2	36.0	80	276.6	43.8
31	30.6	04.8	81	80.0	12.7	31	129.4	20.5	181	178.8	28.3	231	228.2	36.1	281	277.5	43.9
32	31.6	05.0	82	81.0	12.8	32	130.4	20.6	82	179.8	28.5	32	229.1	36.3	82	278.5	44.1
33	32.6	05.2	83	82.0	13.0	33	131.4	20.8	83	180.7	28.6	33	230.1	36.4	83	279.5	44.3
34	33.6	05.3	84	83.0	13.2	34	132.4	21.0	84	181.7	28.8	34	231.1	36.6	84	280.5	44.4
35	34.6	05.5	85	84.0	13.3	35	133.3	21.1	85	182.7	28.9	35	232.1	36.8	85	281.5	44.6
36	35.6	05.6	86	84.9	13.5	36	134.3	21.3	186	183.7	29.1	236	233.1	36.9	286	282.5	44.7
37	36.5	05.8	87	85.9	13.6	37	135.3	21.4	87	184.7	29.2	37	234.1	37.1	87	283.5	44.9
38	37.5	05.9	88	86.9	13.8	38	136.3	21.6	88	185.7	29.4	38	235.1	37.2	88	284.5	45.0
39	38.5	06.1	89	87.9	13.9	39	137.3	21.7	89	186.7	29.6	39	236.1	37.4	89	285.4	45.2
40	39.5	06.3	90	88.9	14.1	40	138.3	21.9	90	187.7	29.7	40	237.0	37.5	90	286.4	45.4
41	40.5	06.4	91	89.9	14.2	41	139.3	22.1	191	188.7	29.9	241	238.0	37.7	291	287.4	45.5
42	41.5	06.6	92	90.9	14.4	42	140.3	22.2	92	189.6	30.0	42	239.0	37.8	92	288.4	45.7
43	42.5	06.7	93	91.9	14.5	43	141.2	22.4	93	190.6	30.2	43	240.0	38.0	93	289.4	45.8
44	43.5	06.9	94	92.8	14.7	44	142.2	22.5	94	191.6	30.3	44	241.0	38.2	94	290.4	46.0
45	44.4	07.0	95	93.8	14.9	45	143.2	22.7	95	192.6	30.5	45	242.0	38.3	95	291.4	46.1
46	45.4	07.2	96	94.8	15.0	46	144.2	22.8	196	193.6	30.7	246	243.0	38.5	296	292.4	46.3
47	46.4	07.4	97	95.8	15.2	47	145.2	23.0	97	194.6	30.8	47	244.0	38.6	97	293.3	46.5
48	47.4	07.5	98	96.8	15.3	48	146.2	23.1	98	195.6	31.0	48	244.9	38.8	98	294.3	46.6
49	48.4	07.7	99	97.8	15.5	49	147.2	23.3	99	196.6	31.1	49	245.9	38.9	99	295.3	46.8
50	49.4	07.8	100	98.8	15.6	50	148.2	23.5	200	197.5	31.3	250	246.9	39.1	300	296.3	46.9
Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep

*for 81 Deg.*

## Difference of Latitude and Departure for 10 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	50.2	08.8	101	99.5	17.5	151	148.7	26.2	201	197.9	34.9	251	247.2	43.5
2	02.0	00.3	52	51.2	09.0	02	100.4	17.7	52	149.7	26.4	02	198.9	35.0	52	248.2	43.7
3	03.0	00.5	53	52.2	09.2	03	101.4	17.9	53	150.7	26.5	03	199.9	35.2	53	249.2	43.9
4	03.9	00.7	54	53.2	09.4	04	102.4	18.0	54	151.7	26.7	04	200.9	35.4	54	250.1	44.0
5	04.9	00.9	55	54.2	09.5	05	103.4	18.2	55	152.6	26.9	05	201.9	35.5	55	251.1	44.2
6	05.9	01.0	56	55.1	09.7	106	104.4	18.4	156	153.6	27.1	206	202.9	35.7	256	252.1	44.4
7	06.9	01.2	57	56.1	09.9	07	105.4	18.6	57	154.6	27.2	07	203.9	35.9	57	253.1	44.6
8	07.9	01.4	58	57.1	10.1	08	106.4	18.7	58	155.6	27.4	08	204.8	36.1	58	254.1	44.7
9	08.9	01.6	59	58.1	10.2	09	107.3	18.9	59	156.6	27.6	09	205.8	36.2	59	255.1	44.9
10	09.8	01.7	60	59.1	10.4	10	108.3	19.1	60	157.6	27.7	10	206.8	36.4	60	256.0	45.1
11	10.8	01.9	61	60.1	10.6	111	109.3	19.2	161	158.6	27.9	211	207.8	36.6	261	257.0	45.3
12	11.8	02.1	62	61.1	10.8	12	110.3	19.4	62	159.5	28.1	12	208.8	36.8	62	258.0	45.4
13	12.8	02.3	63	62.0	10.9	13	111.3	19.6	63	160.5	28.3	13	209.8	36.9	63	259.0	45.6
14	13.8	02.4	64	63.0	11.1	14	112.3	19.8	64	161.5	28.4	14	210.7	37.1	64	260.0	45.8
15	14.8	02.6	65	64.0	11.2	15	113.3	19.9	65	162.5	28.6	15	211.7	37.3	65	261.0	46.0
16	15.8	02.8	66	65.0	11.4	116	114.2	20.1	166	163.5	28.8	216	212.7	37.5	266	262.0	46.1
17	16.7	02.9	67	66.0	11.6	17	115.2	20.3	67	164.5	29.0	17	213.7	37.6	67	262.9	46.3
18	17.7	03.1	68	67.0	11.8	18	116.2	20.5	68	165.4	29.1	18	214.7	37.8	68	263.9	46.5
19	18.7	03.3	69	68.0	12.0	19	117.2	20.6	69	166.4	29.3	19	215.7	38.0	69	264.9	46.6
20	19.7	03.5	70	68.9	12.1	20	118.2	20.8	70	167.4	29.5	20	216.7	38.1	70	265.9	46.8
21	20.7	03.6	71	69.9	12.3	121	119.2	21.0	171	168.4	29.7	221	217.6	38.3	271	266.9	47.0
22	21.7	03.8	72	70.9	12.5	22	120.1	21.2	72	169.4	29.8	22	218.6	38.5	72	267.9	47.2
23	22.7	04.0	73	71.9	12.7	23	121.1	21.3	73	170.4	30.0	23	219.6	38.7	73	268.8	47.3
24	23.6	04.2	74	72.9	12.8	24	122.1	21.5	74	171.4	30.2	24	220.6	38.8	74	269.8	47.5
25	24.6	04.3	75	73.9	13.0	25	123.1	21.7	75	172.3	30.3	25	221.6	39.0	75	270.8	47.7
26	25.6	04.5	76	74.8	13.2	126	124.1	21.8	176	173.3	30.5	226	222.6	39.2	276	271.8	47.9
27	26.6	04.7	77	75.8	13.4	27	125.1	22.0	77	174.3	30.7	27	223.5	39.4	77	272.8	48.0
28	27.6	04.9	78	76.8	13.5	28	126.1	22.2	78	175.3	30.9	28	224.5	39.5	78	273.8	48.2
29	28.6	05.0	79	77.8	13.7	29	127.0	22.4	79	176.3	31.0	29	225.5	39.7	79	274.8	48.4
30	29.5	05.2	80	78.8	13.9	30	128.0	22.5	80	177.3	31.2	30	226.5	39.9	80	275.7	48.6
31	30.5	05.4	81	79.8	14.0	131	129.0	22.7	181	178.2	31.4	231	227.5	40.1	281	276.7	48.7
32	31.5	05.5	82	80.8	14.2	32	130.0	22.9	82	179.2	31.6	32	228.5	40.2	82	277.7	48.9
33	32.5	05.7	83	81.7	14.4	33	131.0	23.1	83	180.2	31.7	33	229.5	40.4	83	278.7	49.1
34	33.5	05.9	84	82.7	14.6	34	132.0	23.2	84	181.2	31.9	34	230.4	40.6	84	279.7	49.2
35	34.5	06.1	85	83.7	14.7	35	132.9	23.4	85	182.2	32.1	35	231.4	40.7	85	280.7	49.4
36	35.5	06.2	86	84.7	14.9	136	133.9	23.6	186	183.2	32.3	236	232.4	40.9	286	281.6	49.6
37	36.4	06.4	87	85.7	15.1	37	134.9	23.8	87	184.2	32.4	37	233.4	41.1	87	282.6	49.8
38	37.4	06.6	88	86.7	15.3	38	135.9	23.9	88	185.1	32.6	38	234.4	41.3	88	283.6	49.9
39	38.4	06.8	89	87.6	15.4	39	136.9	24.1	89	186.1	32.8	39	235.4	41.4	89	284.6	50.1
40	39.4	06.9	90	88.6	15.6	40	137.9	24.3	90	187.1	32.9	40	236.3	41.6	90	285.6	50.3
41	40.4	07.1	91	89.6	15.8	141	138.9	24.4	191	188.1	33.1	241	237.3	41.8	291	286.6	50.5
42	41.4	07.3	92	90.6	16.0	42	139.8	24.6	92	189.1	33.3	42	238.3	42.0	92	287.6	50.6
43	42.3	07.5	93	91.6	16.1	43	140.8	24.8	93	190.1	33.5	43	239.3	42.1	93	288.5	50.8
44	43.3	07.6	94	92.6	16.3	44	141.8	25.0	94	191.0	33.6	44	240.3	42.3	94	289.5	51.0
45	44.3	07.8	95	93.6	16.5	45	142.8	25.1	95	192.0	33.8	45	241.3	42.5	95	290.5	51.2
46	45.3	08.0	96	94.5	16.6	146	143.8	25.3	196	193.0	34.0	246	242.3	42.7	296	291.5	51.3
47	46.3	08.1	97	95.5	16.8	47	144.8	25.5	97	194.0	34.2	47	243.2	42.8	97	292.5	51.5
48	47.3	08.3	98	96.5	17.0	48	145.7	25.7	98	195.0	34.3	48	244.2	43.0	98	293.5	51.7
49	48.3	08.5	99	97.5	17.2	49	146.7	25.8	99	196.0	34.5	49	245.2	43.2	99	294.5	51.8
50	49.2	08.7	100	98.5	17.3	150	147.7	26.0	200	197.0	34.7	250	246.2	43.4	300	295.4	52.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 80 Deg.



# Difference of Latitude and Departure for 11 Deg.

11

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	50.1	09.7	101	99.1	19.3	151	148.2	28.8	201	197.3	38.4	251	246.4	47.9
2	02.0	00.4	52	51.0	09.9	02	100.1	19.5	52	149.2	29.0	02	198.3	38.5	52	247.4	48.1
3	02.9	00.6	53	52.0	10.1	03	101.1	19.7	53	150.2	29.2	03	199.3	38.7	53	248.3	48.3
4	03.9	00.8	54	53.0	10.3	04	102.1	19.8	54	151.2	29.4	04	200.2	38.9	54	249.3	48.5
5	04.9	01.0	55	54.0	10.5	05	103.1	20.0	55	152.1	29.6	05	201.2	39.1	55	250.3	48.7
6	05.9	01.1	56	55.0	10.7	106	104.0	20.2	156	153.1	29.8	206	202.2	39.3	256	251.3	48.8
7	06.9	01.3	57	56.0	10.9	07	105.0	20.4	57	154.1	30.0	07	203.2	39.5	57	252.3	49.0
8	07.9	01.5	58	56.9	11.1	08	106.0	20.6	58	155.1	30.1	08	204.2	39.7	58	253.2	49.2
9	08.8	01.7	59	57.9	11.3	09	107.0	20.8	59	156.1	30.3	09	205.2	39.9	59	254.2	49.4
10	09.8	01.9	60	58.9	11.4	10	108.0	21.0	60	157.1	30.5	10	206.1	40.1	60	255.2	49.6
11	10.8	02.1	61	59.9	11.6	111	109.0	21.2	161	158.0	30.7	211	207.1	40.3	261	256.2	49.8
12	11.8	02.3	62	60.9	11.8	12	109.9	21.4	62	159.0	30.9	12	208.1	40.4	62	257.2	50.0
13	12.8	02.5	63	61.8	12.0	13	110.9	21.6	63	160.0	31.1	13	209.1	40.6	63	258.2	50.2
14	13.7	02.7	64	62.8	12.2	14	111.9	21.8	64	161.0	31.3	14	210.1	40.8	64	259.1	50.4
15	14.7	02.9	65	63.8	12.4	15	112.9	21.9	65	162.0	31.5	15	211.0	41.0	65	260.1	50.6
16	15.7	03.1	66	64.8	12.6	116	113.9	22.1	166	162.9	31.7	216	212.0	41.2	266	261.1	50.8
17	16.7	03.2	67	65.8	12.8	17	114.8	22.3	67	163.9	31.9	17	213.0	41.4	67	262.1	50.9
18	17.7	03.4	68	66.7	13.0	18	115.8	22.5	68	164.9	32.1	18	214.0	41.6	68	263.1	51.1
19	18.7	03.6	69	67.7	13.2	19	116.8	22.7	69	165.9	32.2	19	215.0	41.8	69	264.0	51.3
20	19.6	03.8	70	68.7	13.4	20	117.8	22.9	70	166.9	32.4	20	215.9	42.0	70	265.0	51.5
21	20.6	04.0	71	69.7	13.5	121	118.8	23.1	171	167.9	32.6	221	216.9	42.2	271	266.0	51.7
22	21.6	04.2	72	70.7	13.7	22	119.8	23.3	72	168.8	32.8	22	217.9	42.4	72	267.0	51.9
23	22.6	04.4	73	71.7	13.9	23	120.7	23.5	73	169.8	33.0	23	218.9	42.5	73	268.0	52.1
24	23.6	04.6	74	72.6	14.1	24	121.7	23.7	74	170.8	33.2	24	219.9	42.7	74	269.0	52.3
25	24.5	04.8	75	73.6	14.3	25	122.7	23.9	75	171.8	33.4	25	220.9	42.9	75	269.9	52.5
26	25.5	05.0	76	74.6	14.5	126	123.7	24.0	176	172.8	33.6	226	221.8	43.1	276	270.9	52.7
27	26.5	05.2	77	75.6	14.7	27	124.7	24.2	77	173.7	33.8	27	222.8	43.3	77	271.9	52.9
28	27.5	05.3	78	76.6	14.9	28	125.6	24.4	78	174.7	34.0	28	223.8	43.5	78	272.9	53.0
29	28.5	05.5	79	77.5	15.1	29	126.6	24.6	79	175.7	34.2	29	224.8	43.7	79	273.9	53.2
30	29.4	05.7	80	78.5	15.3	30	127.6	24.8	80	176.7	34.3	30	225.8	43.9	80	274.8	53.4
31	30.4	05.9	81	79.5	15.5	131	128.6	25.0	181	177.7	34.5	231	226.7	44.1	281	275.8	53.6
32	31.4	06.1	82	80.5	15.6	32	129.6	25.2	82	178.6	35.7	32	227.7	44.3	82	276.8	53.8
33	32.4	06.3	83	81.5	15.8	33	130.6	25.4	83	179.6	34.9	33	228.7	44.5	83	277.8	54.0
34	33.4	06.5	84	82.5	16.0	34	131.5	25.6	84	180.6	35.1	34	229.7	44.6	84	278.8	54.2
35	34.4	06.7	85	83.4	16.2	35	132.5	25.8	85	181.6	35.3	35	230.7	44.8	85	279.8	54.4
36	35.3	06.9	86	84.4	16.4	136	133.5	25.9	186	182.6	35.5	236	231.7	45.0	286	280.7	54.6
37	36.3	07.1	87	85.4	16.6	37	134.5	26.1	87	183.6	35.7	37	232.6	45.2	87	281.7	54.8
38	37.3	07.3	88	86.4	16.8	38	135.5	26.3	88	184.5	35.9	38	233.6	45.4	88	282.7	55.0
39	38.3	07.4	89	87.4	17.0	39	136.4	26.5	89	185.5	36.1	39	234.6	45.6	89	283.7	55.1
40	39.3	07.6	90	88.3	17.2	40	137.4	26.7	90	186.5	36.3	40	235.6	45.8	90	284.7	55.3
41	40.2	07.8	91	89.3	17.4	141	138.4	26.9	191	187.5	36.4	241	236.6	46.0	291	285.6	55.5
42	41.2	08.0	92	90.3	17.6	42	139.4	27.1	92	188.5	36.6	42	237.5	46.2	92	286.6	55.7
43	42.2	08.2	93	91.3	17.7	43	140.4	27.3	93	189.4	36.8	43	238.5	46.4	93	287.6	56.9
44	43.2	08.4	94	92.3	17.9	44	141.3	27.5	94	190.4	37.0	44	239.5	46.6	94	288.6	56.0
45	44.2	08.6	95	93.3	18.1	45	142.3	27.7	95	191.4	37.2	45	240.5	46.7	95	289.6	56.3
46	45.2	08.8	96	94.2	18.3	146	143.3	27.9	196	192.4	37.4	246	241.5	47.0	296	290.5	56.5
47	46.1	09.0	97	95.2	18.5	47	144.3	28.0	97	193.4	37.6	47	242.5	47.1	97	291.5	56.7
48	47.1	09.2	98	96.2	18.7	48	145.3	28.2	98	194.4	37.8	48	243.4	47.3	98	292.5	56.9
49	48.1	09.3	99	97.2	18.9	49	146.3	28.4	99	195.4	38.0	49	244.4	47.5	99	293.5	57.0
50	49.1	09.5	100	98.2	19.1	150	147.2	28.6	200	196.3	38.2	250	245.4	47.7	300	294.5	57.2
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 79 Deg.



## Difference of Latitude and Departure for 12 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	49.9	10.6	101	98.8	21.0	151	147.7	31.4	201	196.6	41.8	251	245.5	52.2
2	02.0	00.4	52	50.9	10.8	02	99.8	21.2	52	148.7	31.6	02	197.6	42.0	52	246.5	52.4
3	02.9	00.6	53	51.8	11.0	03	100.7	21.4	53	149.6	31.8	03	198.5	42.2	53	247.4	52.6
4	03.9	00.8	54	52.8	11.2	04	101.7	21.6	54	150.6	32.0	04	199.5	42.4	54	248.4	52.8
5	04.9	01.0	55	53.8	11.4	05	102.7	21.8	55	151.6	32.2	05	200.5	42.6	55	249.4	53.0
6	05.9	01.2	56	54.8	11.6	106	103.7	22.0	156	152.6	32.4	206	201.5	42.8	256	250.4	53.2
7	06.8	01.5	57	55.7	11.9	07	104.6	22.3	57	153.5	32.7	07	202.4	43.1	57	251.3	53.5
8	07.8	01.7	58	56.7	12.1	08	105.6	22.5	58	154.5	32.9	08	203.4	43.3	58	252.3	53.7
9	08.8	01.9	59	57.7	12.3	09	106.6	22.7	59	155.5	33.1	09	204.4	43.5	59	253.3	53.9
10	09.8	02.1	60	58.7	12.5	10	107.6	22.9	60	156.5	33.3	10	205.4	43.7	60	254.3	54.1
11	10.8	02.3	61	59.7	12.7	111	108.6	23.1	161	157.5	33.5	211	206.4	43.9	261	255.3	54.3
12	11.7	02.5	62	60.6	12.9	12	109.5	23.3	62	158.4	33.7	12	207.3	44.1	62	256.2	54.5
13	12.7	02.7	63	61.6	13.1	13	110.5	23.5	63	159.4	33.9	13	208.3	44.3	63	257.2	54.7
14	13.7	02.9	64	62.6	13.3	14	111.5	23.7	64	160.4	34.1	14	209.3	44.5	64	258.2	54.9
15	14.7	03.1	65	63.6	13.5	15	112.5	23.9	65	161.4	34.3	15	210.3	44.7	65	259.2	55.1
16	15.6	03.3	66	64.5	13.7	116	113.4	24.1	166	162.3	34.5	216	211.2	44.9	266	260.1	55.3
17	16.6	03.5	67	65.5	13.9	17	114.4	24.3	67	163.3	34.7	17	212.2	45.1	67	261.1	55.5
18	17.6	03.7	68	66.5	14.1	18	115.4	24.5	68	164.3	34.9	18	213.2	45.3	68	262.1	55.7
19	18.6	04.0	69	67.5	14.4	19	116.4	24.8	69	165.3	35.2	19	214.2	45.6	69	263.1	56.0
20	19.6	04.2	70	68.5	14.6	20	117.4	25.0	70	166.3	35.4	20	215.2	45.8	70	264.1	56.2
21	20.5	04.4	71	69.4	14.8	121	118.3	25.2	171	167.2	35.6	221	216.1	46.0	271	265.0	56.4
22	21.5	04.6	72	70.4	15.0	22	119.3	25.4	72	168.2	35.8	22	217.1	46.2	72	266.0	56.6
23	22.5	04.8	73	71.4	15.2	23	120.3	25.6	73	169.2	36.0	23	218.1	46.4	73	267.0	56.8
24	23.5	05.0	74	72.4	15.4	24	121.3	25.8	74	170.2	36.2	24	219.1	46.6	74	268.0	57.0
25	24.5	05.2	75	73.4	15.6	25	122.3	26.0	75	171.2	36.4	25	220.1	46.8	75	269.0	57.2
26	25.4	05.4	76	74.3	15.8	126	123.2	26.2	176	172.1	36.6	226	221.0	47.0	276	269.9	57.4
27	26.4	05.6	77	75.3	16.0	27	124.2	26.4	77	173.1	36.8	27	222.0	47.2	77	270.9	57.6
28	27.4	05.8	78	76.3	16.2	28	125.2	26.6	78	174.1	37.0	28	223.0	47.4	78	271.9	57.8
29	28.4	06.0	79	77.3	16.4	29	126.2	26.8	79	175.1	37.2	29	224.0	47.6	79	272.9	58.0
30	29.3	06.2	80	78.2	16.6	30	127.1	27.0	80	176.0	37.4	30	224.9	47.8	80	273.8	58.2
31	30.3	06.4	81	79.2	16.8	131	128.1	27.2	181	177.0	37.6	231	225.9	48.0	281	274.8	58.4
32	31.3	06.7	82	80.2	17.1	32	129.1	27.5	82	178.0	37.9	32	226.9	48.3	82	275.8	58.7
33	32.3	06.9	83	81.2	17.3	33	130.1	27.7	83	179.0	38.1	33	227.9	48.5	83	276.8	58.9
34	33.3	07.1	84	82.2	17.5	34	131.1	27.9	84	180.0	38.3	34	228.9	48.7	84	277.8	59.1
35	34.2	07.3	85	83.1	17.7	35	132.0	28.1	85	180.9	38.5	35	229.8	48.9	85	278.7	59.3
36	35.2	07.5	86	84.1	17.9	136	133.0	28.3	186	181.9	38.7	236	230.8	49.1	286	279.7	59.5
37	36.2	07.7	87	85.1	18.0	37	134.0	28.5	87	182.9	38.9	37	231.8	49.3	87	280.7	59.7
38	37.2	07.9	88	86.1	18.3	38	135.0	28.7	88	183.9	39.1	38	232.8	49.5	88	281.7	59.9
39	38.1	08.1	89	87.0	18.5	39	135.9	28.9	89	184.8	39.3	39	233.7	49.7	89	282.6	60.1
40	39.1	08.3	90	88.0	18.7	40	136.9	29.1	90	185.8	39.5	40	234.7	49.9	90	283.6	60.3
41	40.1	08.5	91	89.0	18.9	141	137.9	29.3	191	186.8	39.7	241	235.7	50.1	291	284.6	60.5
42	41.1	08.7	92	90.0	19.1	42	138.9	29.5	92	187.8	39.9	42	236.7	50.3	92	285.6	60.7
43	42.1	08.9	93	91.0	19.3	43	139.9	29.7	93	188.8	40.1	43	237.7	50.5	93	286.6	60.9
44	43.0	09.2	94	91.9	19.6	44	140.8	30.0	94	189.7	40.4	44	238.6	50.8	94	287.5	61.2
45	44.0	09.4	95	92.9	19.8	45	141.8	30.2	95	190.7	40.6	45	239.6	51.0	95	288.5	61.4
46	45.0	09.6	96	93.9	20.0	146	142.8	30.4	196	191.7	40.8	246	240.6	51.2	296	289.5	61.6
47	46.0	09.8	97	94.9	20.2	47	143.8	30.6	97	192.7	41.0	47	241.6	51.4	97	290.5	61.8
48	46.9	10.0	98	95.8	20.4	48	144.7	30.8	98	193.6	41.2	48	242.5	51.6	98	291.4	62.0
49	47.9	10.2	99	96.8	20.6	49	145.7	31.0	99	194.6	41.4	49	243.5	51.8	99	292.4	62.2
50	48.9	10.4	100	97.8	20.8	150	146.7	31.2	200	195.6	41.6	250	244.5	52.0	300	293.4	62.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 78 Deg.

# Difference of Latitude and Departure for 13 Deg.

13

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	49.7	11.5	101	98.4	22.7	151	147.1	34.0	201	195.9	45.2	251	244.6	56.5
2	01.9	00.4	52	50.7	11.7	02	99.4	22.9	52	148.1	34.2	02	196.8	45.4	52	245.5	56.7
3	02.9	00.7	53	51.6	11.9	03	100.4	23.2	53	149.1	34.4	03	197.8	45.7	53	246.5	56.9
4	03.9	00.9	54	52.6	12.1	04	101.3	23.4	54	150.1	34.6	04	198.8	45.9	54	247.5	57.1
5	04.9	01.1	55	53.6	12.4	05	102.3	23.6	55	151.0	34.9	05	199.7	46.1	55	248.5	57.4
6	05.8	01.3	56	54.6	12.6	106	103.3	23.8	156	152.0	35.1	206	200.7	46.3	256	249.4	57.6
7	06.8	01.6	57	55.5	12.8	07	104.3	24.1	57	153.0	35.3	07	201.7	46.6	57	250.4	57.8
8	07.8	01.8	58	56.5	13.0	08	105.2	24.3	58	154.0	35.5	08	202.7	46.8	58	251.4	58.0
9	08.8	02.0	59	57.5	13.3	09	106.2	24.5	59	154.9	35.3	09	203.6	47.0	59	252.4	58.3
10	09.7	02.2	60	58.5	13.5	10	107.2	24.7	60	155.9	36.0	10	204.6	47.2	60	253.3	58.5
11	10.7	02.5	61	59.4	13.7	111	108.2	25.0	161	156.9	36.2	211	205.6	47.5	261	254.3	58.7
12	11.7	02.7	62	60.4	13.9	12	109.1	25.2	62	157.9	36.4	12	206.6	47.7	62	255.3	58.9
13	12.7	02.9	63	61.4	14.2	13	110.1	25.4	63	158.8	36.7	13	207.5	47.9	63	256.3	59.2
14	13.6	03.1	64	62.4	14.4	14	111.1	25.6	64	159.8	36.9	14	208.5	48.1	64	257.2	59.4
15	14.6	03.4	65	63.3	14.6	15	112.1	25.9	65	160.8	37.1	15	209.5	48.4	65	258.2	59.6
16	15.6	03.6	66	64.3	14.8	116	113.0	26.1	166	161.7	37.3	216	210.5	48.6	266	259.2	59.8
17	16.6	03.8	67	65.3	15.1	17	114.0	26.3	67	162.7	37.6	17	211.4	48.8	67	260.2	60.1
18	17.5	04.0	68	66.3	15.3	18	115.0	26.5	68	163.7	37.8	18	212.4	49.0	68	261.1	60.3
19	18.5	04.3	69	67.2	15.5	19	116.0	26.8	69	164.7	38.0	19	213.4	49.3	69	262.1	60.5
20	19.5	04.5	70	68.2	15.7	20	116.9	27.0	70	165.6	38.2	20	214.4	49.5	70	263.1	60.7
21	20.5	04.7	71	69.2	16.0	121	117.9	27.2	171	166.6	38.5	221	215.3	49.7	271	264.1	61.0
22	21.4	04.9	72	70.2	16.2	22	118.9	27.4	72	167.6	38.7	22	216.3	49.9	72	265.0	61.2
23	22.4	05.2	73	71.1	16.4	23	119.8	27.7	73	168.6	38.9	23	217.3	50.2	73	266.0	61.4
24	23.4	05.4	74	72.1	16.6	24	120.8	27.9	74	169.5	39.1	24	218.3	50.4	74	267.0	61.6
25	24.4	05.6	75	73.1	16.9	25	121.8	28.1	75	170.5	39.4	25	219.2	50.6	75	268.0	61.9
26	25.3	05.8	76	74.1	17.1	126	122.8	28.3	176	171.5	39.6	226	220.2	50.8	276	268.9	62.1
27	26.3	06.1	77	75.0	17.3	27	123.7	28.6	77	172.5	39.8	27	221.2	51.1	77	269.9	62.3
28	27.3	06.3	78	76.0	17.5	28	124.7	28.8	78	173.4	40.0	28	222.2	51.3	78	270.9	62.5
29	28.3	06.5	79	77.0	17.8	29	125.7	29.0	79	174.4	40.3	29	223.1	51.5	79	271.9	62.8
30	29.2	06.7	80	78.0	18.0	30	126.7	29.2	80	175.4	40.5	30	224.1	51.7	80	272.8	63.0
31	30.2	07.0	81	78.9	18.2	131	127.6	29.5	181	176.4	40.7	231	225.1	52.0	281	273.8	63.2
32	31.2	07.2	82	79.9	18.4	32	128.6	29.7	82	177.3	40.9	32	226.1	52.2	82	274.8	63.4
33	32.2	07.4	83	80.9	18.7	33	129.6	29.9	83	178.3	41.2	33	227.0	52.4	83	275.8	63.7
34	33.1	07.6	84	81.8	18.9	34	130.6	30.1	84	179.3	41.4	34	228.0	52.6	84	276.7	63.9
35	34.1	07.9	85	82.8	19.1	35	131.5	30.4	85	180.3	41.6	35	229.0	52.9	85	277.7	64.1
36	35.1	08.1	86	83.8	19.3	136	132.5	30.6	186	181.2	41.8	236	230.0	53.1	286	278.7	64.3
37	36.1	08.3	87	84.8	19.6	37	133.5	30.8	87	182.2	42.1	37	230.9	53.3	87	279.6	64.6
38	37.0	08.5	88	85.7	19.8	38	134.5	31.0	88	183.2	42.3	38	231.9	53.5	88	280.6	64.8
39	38.0	08.8	89	86.7	20.0	39	135.4	31.3	89	184.2	42.5	39	232.9	53.8	89	281.6	65.0
40	39.0	09.0	90	87.7	20.2	40	136.4	31.5	90	185.1	42.7	40	233.9	54.0	90	282.6	65.2
41	39.9	09.2	91	88.7	20.5	141	137.4	31.7	191	186.1	43.0	241	234.8	54.2	291	283.5	65.5
42	40.9	09.4	92	89.6	20.7	42	138.4	31.9	92	187.1	43.2	42	235.8	54.4	92	284.5	65.7
43	41.9	09.7	93	90.6	20.9	43	139.3	32.2	93	188.1	43.4	43	236.8	54.7	93	285.5	65.9
44	42.9	09.9	94	91.6	21.1	44	140.3	32.4	94	189.0	43.6	44	237.8	54.9	94	286.5	66.1
45	43.8	10.1	95	92.6	21.4	45	141.3	32.6	95	190.0	43.9	45	238.7	55.1	95	287.4	66.4
46	44.8	10.3	96	93.5	21.6	146	142.3	32.8	196	191.0	44.1	246	239.7	55.3	296	288.4	66.6
47	45.8	10.6	97	94.5	21.8	47	143.2	33.1	97	192.0	44.3	47	240.7	55.6	97	289.4	66.8
48	46.8	10.8	98	95.5	22.0	48	144.2	33.3	98	192.9	44.5	48	241.6	55.8	98	290.4	67.0
49	47.7	11.0	99	96.5	22.3	49	145.2	33.5	99	193.9	44.8	49	242.6	56.0	99	291.3	67.3
50	48.7	11.2	100	97.4	22.5	150	146.2	33.7	200	194.9	45.0	250	243.6	56.2	300	292.3	67.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 77 Deg.



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	49.5	12.3	101	98.0	24.4	151	146.5	36.5	201	195.0	48.6	251	243.5	60.7
2	01.9	00.5	52	50.5	12.6	02	99.0	24.7	52	147.5	36.8	02	196.0	48.9	52	244.5	61.0
3	02.9	00.7	53	51.4	12.8	03	99.9	24.9	53	148.5	37.0	03	197.0	49.1	53	245.5	61.2
4	03.9	01.0	54	52.4	13.1	04	100.9	25.2	54	149.4	37.3	04	197.9	49.4	54	246.4	61.5
5	04.9	01.2	55	53.4	13.3	05	101.9	25.4	55	150.4	37.5	05	198.9	49.6	55	247.4	61.7
6	05.8	01.5	56	54.3	13.6	106	102.8	25.7	156	151.4	37.7	206	199.9	49.9	256	248.4	62.0
7	06.8	01.7	57	55.3	13.8	07	103.8	25.9	57	152.3	38.0	07	200.8	50.1	57	249.4	62.2
8	07.8	01.9	58	56.3	14.0	08	104.8	26.1	58	153.3	38.2	08	201.8	50.3	58	250.3	62.4
9	08.7	02.2	59	57.2	14.3	09	105.8	26.4	59	154.3	38.5	09	202.8	50.6	59	251.3	62.7
10	09.7	02.4	60	58.2	14.5	10	106.7	26.6	60	155.2	38.7	10	203.8	50.8	60	252.3	62.9
11	10.7	02.7	61	59.2	14.8	111	107.7	26.9	161	156.2	39.0	211	204.7	51.1	261	253.2	63.2
12	11.6	02.9	62	60.2	15.0	12	108.7	27.1	62	157.2	39.2	12	205.7	51.3	62	254.2	63.4
13	12.6	03.1	63	61.1	15.2	13	109.6	27.3	63	158.2	39.4	13	206.7	51.5	63	255.2	63.6
14	13.6	03.4	64	62.1	15.5	14	110.6	27.6	64	159.1	39.7	14	207.6	51.8	64	256.2	63.9
15	14.6	03.6	65	63.1	15.7	15	111.6	27.8	65	160.1	39.9	15	208.6	52.0	65	257.1	64.1
16	15.5	03.9	66	64.0	16.0	116	112.6	28.1	166	161.1	40.2	216	209.6	52.3	266	258.1	64.4
17	16.5	04.1	67	65.0	16.2	17	113.5	28.3	67	162.0	40.4	17	210.5	52.5	67	259.1	64.6
18	17.5	04.4	68	66.0	16.5	18	114.5	28.6	68	163.0	40.7	18	211.5	52.8	68	260.0	64.9
19	18.4	04.6	69	66.9	16.7	19	115.5	28.8	69	164.0	40.9	19	212.5	53.0	69	261.0	65.1
20	19.4	04.8	70	67.9	16.9	20	116.4	29.0	70	164.9	41.1	20	213.5	53.2	70	262.0	65.3
21	20.4	05.1	71	68.9	17.2	121	117.4	29.3	171	165.9	41.4	221	214.4	53.5	271	262.9	65.6
22	21.3	05.3	72	69.9	17.4	22	118.4	29.5	72	166.9	41.6	22	215.4	53.7	72	263.9	65.8
23	22.3	05.6	73	70.8	17.7	23	119.3	29.8	73	167.9	41.9	23	216.4	54.0	73	264.9	66.1
24	23.3	05.8	74	71.8	17.9	24	120.3	30.0	74	168.8	42.1	24	217.3	54.2	74	265.9	66.3
25	24.3	06.0	75	72.8	18.1	25	121.3	30.2	75	169.8	42.3	25	218.3	54.4	75	266.8	66.5
26	25.2	06.3	76	73.7	18.4	126	122.3	30.5	176	170.8	42.6	226	219.3	54.7	276	267.8	66.8
27	26.2	06.5	77	74.7	18.6	27	123.2	30.7	77	171.7	42.8	27	220.3	54.9	77	268.8	67.0
28	27.2	06.8	78	75.7	18.9	28	124.2	31.0	78	172.7	43.1	28	221.2	55.2	78	269.7	67.3
29	28.1	07.0	79	76.7	19.1	29	125.2	31.2	79	173.7	43.3	29	222.2	55.4	79	270.7	67.5
30	29.1	07.3	80	77.6	19.4	30	126.1	31.5	80	174.6	43.6	30	223.2	55.7	80	271.7	67.8
31	30.1	07.5	81	78.6	19.6	131	127.1	31.7	181	175.6	43.8	231	224.1	55.9	281	272.6	68.0
32	31.0	07.7	82	79.6	19.8	32	128.1	31.9	82	176.6	44.0	32	225.1	56.1	82	273.6	68.2
33	32.0	08.0	83	80.5	20.1	33	129.0	32.2	83	177.6	44.3	33	226.1	56.4	83	274.6	68.5
34	33.0	08.2	84	81.5	20.3	34	130.0	32.4	84	178.5	44.5	34	227.0	56.6	84	275.6	68.7
35	34.0	08.5	85	82.5	20.6	35	131.0	32.7	85	179.5	44.8	35	228.0	56.9	85	276.5	69.0
36	34.9	08.7	86	83.4	20.8	136	132.0	32.9	186	180.5	45.0	236	229.0	57.1	286	277.5	69.2
37	35.9	09.0	87	84.4	21.1	37	132.9	33.2	87	181.4	45.3	37	230.0	57.4	87	278.5	69.5
38	36.9	09.2	88	85.4	21.3	38	133.9	33.4	88	182.4	45.5	38	230.9	57.6	88	279.4	69.7
39	37.8	09.4	89	86.4	21.5	39	134.9	33.6	89	183.4	45.7	39	231.9	57.8	89	280.4	69.9
40	38.8	09.7	90	87.3	21.8	40	135.8	33.9	90	184.4	46.0	40	232.9	58.1	90	281.4	70.2
41	39.8	09.9	91	88.3	22.0	141	136.8	34.1	191	185.3	46.2	241	233.8	58.3	291	282.3	70.4
42	40.8	10.2	92	89.3	22.3	42	137.8	34.4	92	186.3	46.5	42	234.8	58.6	92	283.3	70.7
43	41.7	10.4	93	90.2	22.5	43	138.7	34.6	93	187.3	46.7	43	235.8	58.8	93	284.3	70.9
44	42.7	10.6	94	91.2	22.7	44	139.7	34.8	94	188.2	46.9	44	236.7	59.0	94	285.3	71.1
45	43.7	10.9	95	92.2	23.0	45	140.7	35.1	95	189.2	47.2	45	237.7	59.3	95	286.2	71.4
46	44.6	11.1	96	93.1	23.2	146	141.7	35.3	196	190.2	47.4	246	238.7	59.5	296	287.2	71.6
47	45.6	11.4	97	94.1	13.5	47	142.6	35.6	97	191.1	47.7	47	239.7	59.8	97	288.2	71.9
48	46.6	11.6	98	95.1	23.7	48	143.6	35.8	98	192.1	47.9	48	240.6	60.0	98	289.1	72.1
49	47.5	11.9	99	96.1	24.0	49	144.6	36.1	99	193.1	48.2	49	241.6	60.3	99	290.1	72.4
50	48.5	12.1	100	97.0	24.2	150	145.5	36.3	200	194.1	48.4	250	242.6	60.5	300	291.1	72.6
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 76 Deg.

# Difference of Latitude and Departure for 15 Deg.

15

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.3	51	49.3	13.2	101	97.6	26.1	151	145.8	39.1	201	194.1	52.0	251	242.4	65.0
2	01.9	00.5	52	50.2	13.5	02	98.5	26.4	52	146.8	39.3	02	195.1	52.3	52	243.4	65.2
3	02.9	00.8	53	51.2	13.7	03	99.5	26.7	53	147.8	39.6	03	196.1	52.5	53	244.4	65.5
4	03.9	01.0	54	52.2	14.0	04	100.5	26.9	54	148.7	39.9	04	197.0	52.8	54	245.3	65.7
5	04.8	01.3	55	53.1	14.2	05	101.4	27.2	55	149.7	40.1	05	198.0	53.1	55	246.3	66.0
6	05.8	01.6	56	54.1	14.5	106	102.4	27.4	156	150.7	40.4	206	199.0	53.3	256	247.3	66.3
7	06.8	01.8	57	55.1	14.8	07	103.4	27.7	57	151.6	40.6	07	199.9	53.6	57	248.2	66.5
8	07.7	02.1	58	56.0	15.0	08	104.3	28.0	58	152.6	40.9	08	200.9	53.8	58	249.2	66.8
9	08.7	02.3	59	57.0	15.3	09	105.3	28.2	59	153.6	41.1	09	201.9	54.1	59	250.2	67.0
10	09.7	02.6	60	58.0	15.5	10	106.2	28.5	60	154.5	41.4	10	202.8	54.3	60	251.1	67.3
11	10.6	02.8	61	58.9	15.8	111	107.2	28.7	161	155.5	41.7	211	203.8	54.6	261	252.1	67.5
12	11.6	03.1	62	59.9	16.0	12	108.2	29.0	62	156.5	41.9	12	204.8	54.9	62	253.1	67.8
13	12.6	03.4	63	60.9	16.3	13	109.1	29.2	63	157.4	42.2	13	205.7	55.1	63	254.0	68.1
14	13.5	03.6	64	61.8	16.6	14	110.1	29.5	64	158.4	42.4	14	206.7	55.4	64	255.0	68.3
15	14.5	03.9	65	62.8	16.8	15	111.1	29.8	65	159.4	42.7	15	207.7	55.6	65	256.0	68.6
16	15.5	04.1	66	63.7	17.1	116	112.0	30.0	166	160.3	43.0	216	208.6	55.9	266	256.9	68.8
17	16.4	04.4	67	64.7	17.3	17	113.0	30.3	67	161.3	43.2	17	209.6	56.1	67	257.9	69.1
18	17.4	04.7	68	65.7	17.6	18	114.0	30.5	68	162.3	43.5	18	210.6	56.4	68	258.9	69.4
19	18.4	04.9	69	66.6	17.9	19	114.9	30.8	69	163.2	43.7	19	211.5	56.7	69	259.8	69.6
20	19.3	05.2	70	67.6	18.1	20	115.9	31.1	70	164.2	44.0	20	212.5	56.9	70	260.8	69.9
21	20.3	05.4	71	68.6	18.4	121	116.9	31.3	171	165.2	44.3	221	213.5	57.2	271	261.8	70.1
22	21.2	05.7	72	69.5	18.6	22	117.8	31.6	72	166.1	44.5	22	214.4	57.5	72	262.7	70.4
23	22.2	06.0	73	70.5	18.9	23	118.8	31.8	73	167.1	44.8	23	215.4	57.7	73	263.7	70.7
24	23.2	06.2	74	71.5	19.2	24	119.8	32.1	74	168.1	45.0	24	216.4	58.0	74	264.7	70.9
25	24.1	06.5	75	72.4	19.4	25	120.7	32.4	75	169.0	45.3	25	217.3	58.2	75	265.6	71.2
26	25.1	06.7	76	73.4	19.7	126	121.7	32.6	176	170.0	45.5	226	218.3	58.5	276	266.6	71.4
27	26.1	07.0	77	74.4	19.9	27	122.7	32.9	77	171.0	45.8	27	219.3	58.7	77	267.6	71.7
28	27.0	07.2	78	75.3	20.2	28	123.6	33.1	78	171.9	46.1	28	220.2	59.0	78	268.5	71.9
29	28.0	07.5	79	76.3	20.4	29	124.6	33.4	79	172.9	46.3	29	221.2	59.3	79	269.5	72.2
30	29.0	07.8	80	77.3	20.7	30	125.6	33.6	80	173.9	46.6	30	222.2	59.5	80	270.5	72.5
31	29.9	08.0	81	78.2	21.0	131	126.5	33.9	181	174.8	46.8	231	223.1	59.8	281	271.4	72.7
32	30.9	08.3	82	79.2	21.2	32	127.5	34.2	82	175.8	47.1	32	224.1	60.0	82	272.4	73.0
33	31.9	08.5	83	80.2	21.5	33	128.5	34.4	83	176.8	47.4	33	225.1	60.3	83	273.4	73.2
34	32.8	08.8	84	81.1	21.7	34	129.4	34.7	84	177.7	47.6	34	226.0	60.6	84	274.3	73.5
35	33.8	09.1	85	82.1	22.0	35	130.4	34.9	85	178.7	47.9	35	227.0	60.8	85	275.3	73.8
36	34.8	09.3	86	83.1	22.3	136	131.4	35.2	186	179.7	48.1	236	228.0	61.1	286	276.2	74.0
37	35.7	09.6	87	84.0	22.5	37	132.3	35.5	87	180.6	48.4	37	228.9	61.3	87	277.2	74.3
38	36.7	09.8	88	85.0	22.8	38	133.3	35.7	88	181.6	48.7	38	229.9	61.6	88	278.2	74.5
39	37.7	10.1	89	86.0	23.0	39	134.3	36.0	89	182.6	48.9	39	230.9	61.9	89	279.1	74.8
40	38.6	10.4	90	86.9	23.3	40	135.2	36.2	90	183.5	49.2	40	231.8	62.1	90	280.1	75.0
41	39.6	10.6	91	87.9	23.5	141	136.2	36.5	191	184.5	49.4	241	232.8	62.4	291	281.1	75.3
42	40.6	10.9	92	88.9	23.8	42	137.2	36.7	92	185.5	49.7	42	233.7	62.6	92	282.0	75.6
43	41.5	11.1	93	89.8	24.1	43	138.1	37.0	93	186.4	49.9	43	234.7	62.9	93	283.0	75.8
44	42.5	11.4	94	90.8	24.3	44	139.1	37.3	94	187.4	50.2	44	235.7	63.1	94	284.0	76.1
45	43.5	11.6	95	91.8	24.6	45	140.1	37.5	95	188.4	50.5	45	236.6	63.4	95	284.9	76.3
46	44.4	11.9	96	92.7	24.8	146	141.0	37.8	196	189.3	50.7	246	237.6	63.7	296	285.9	76.6
47	45.4	12.2	97	93.7	25.1	47	142.0	38.0	97	190.3	51.0	47	238.6	63.9	97	286.9	76.9
48	46.4	12.4	98	94.7	25.4	48	143.0	38.3	98	191.2	51.2	48	239.5	64.2	98	287.8	77.1
49	47.3	12.7	99	95.6	25.6	49	143.9	38.6	99	192.2	51.5	49	240.5	64.4	99	288.8	77.4
50	48.3	12.9	100	96.6	25.9	150	144.9	38.8	200	193.2	51.8	250	241.5	64.7	300	289.8	77.6
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 75 Deg.



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.3	51	49.0	14.1	101	97.1	27.8	151	145.1	41.6	201	193.2	55.4	251	241.2	69.2
2	01.9	00.6	52	50.0	14.3	02	98.0	28.1	52	146.1	41.9	02	194.1	55.7	52	242.2	69.5
3	02.9	00.8	53	50.9	14.6	03	99.0	28.4	53	147.1	42.2	03	195.1	55.9	53	243.2	69.7
4	03.8	01.1	54	51.9	14.9	04	100.0	28.7	54	148.0	42.4	04	196.1	56.2	54	244.1	70.0
5	04.8	01.4	55	52.9	15.2	05	100.9	28.9	55	149.0	42.7	05	197.0	56.5	55	245.1	70.3
6	05.8	01.7	56	53.8	15.4	106	101.9	29.2	156	149.9	43.0	206	198.0	56.8	256	246.0	70.6
7	06.7	01.9	57	54.8	15.7	07	102.8	29.5	57	150.9	43.3	07	199.0	57.0	57	247.0	70.8
8	07.7	02.2	58	55.7	16.0	08	103.8	29.8	58	151.9	43.5	08	199.9	57.3	58	248.0	71.1
9	08.7	02.5	59	56.7	16.3	09	104.8	30.0	59	152.8	43.8	09	200.9	57.6	59	248.9	71.4
10	09.6	02.8	60	57.7	16.5	10	105.7	30.3	60	153.8	44.1	10	201.8	57.9	60	249.9	71.7
11	10.6	03.0	61	58.6	16.8	111	106.7	30.6	161	154.7	44.4	211	202.8	58.2	261	250.9	71.9
12	11.5	03.3	62	59.6	17.1	12	107.6	30.9	62	155.7	44.6	12	203.8	58.4	62	251.8	72.2
13	12.5	03.6	63	60.6	17.4	13	108.6	31.1	63	156.7	44.9	13	204.7	58.7	63	252.8	72.5
14	13.5	03.9	64	61.5	17.6	14	109.6	31.4	64	157.6	45.2	14	205.7	59.0	64	253.7	72.8
15	14.4	04.1	65	62.5	17.9	15	110.5	31.7	65	158.6	45.5	15	206.6	59.3	65	254.7	73.0
16	15.4	04.4	66	63.4	18.2	116	111.5	32.0	166	159.5	45.7	216	207.6	59.5	266	255.7	73.3
17	16.3	04.7	67	64.4	18.5	17	112.5	32.2	67	160.5	46.0	17	208.6	59.8	67	256.6	73.6
18	17.3	05.0	68	65.4	18.7	18	113.4	32.5	68	161.5	46.3	18	209.5	60.1	68	257.6	73.9
19	18.3	05.2	69	66.3	19.0	19	114.4	32.8	69	162.4	46.6	19	210.5	60.4	69	258.5	74.1
20	19.2	05.5	70	67.3	19.3	20	115.3	33.1	70	163.4	46.9	20	211.4	60.6	70	259.5	74.4
21	20.2	05.8	71	68.2	19.6	121	116.3	33.3	171	164.4	47.1	221	212.4	60.9	271	260.5	74.7
22	21.1	06.1	72	69.2	19.8	22	117.3	33.6	72	165.3	47.4	22	213.4	61.2	72	261.4	75.0
23	22.1	06.3	73	70.2	20.1	23	118.2	33.9	73	166.3	47.7	23	214.3	61.5	73	262.4	75.2
24	23.1	06.6	74	71.1	20.4	24	119.2	34.2	74	167.2	48.0	24	215.3	61.7	74	263.3	75.5
25	24.0	06.9	75	72.1	20.7	25	120.1	34.4	75	168.2	48.2	25	216.3	62.0	75	264.3	75.8
26	25.0	07.2	76	73.0	20.9	126	121.1	34.7	176	169.2	48.5	226	217.2	62.3	276	265.3	76.1
27	26.0	07.4	77	74.0	21.2	27	122.1	35.0	77	170.1	48.8	27	218.2	62.6	77	266.2	76.3
28	26.9	07.7	78	75.0	21.5	28	123.0	35.3	78	171.1	49.1	28	219.1	62.8	78	267.2	76.6
29	27.9	08.0	79	75.9	21.8	29	124.0	35.6	79	172.0	49.3	29	220.1	63.1	79	268.2	76.9
30	28.8	08.3	80	76.9	22.0	30	124.9	35.8	80	173.0	49.6	30	221.1	63.4	80	269.1	77.2
31	29.8	08.5	81	77.9	22.3	131	125.9	36.1	181	174.0	49.9	231	222.0	63.7	281	270.1	77.4
32	30.8	08.8	82	78.8	22.6	32	126.9	36.4	82	174.9	50.2	32	223.0	63.9	82	271.0	77.7
33	31.7	09.1	83	79.8	22.9	33	127.8	36.7	83	175.9	50.4	33	223.9	64.2	83	272.0	78.0
34	32.7	09.4	84	80.7	23.1	34	128.8	36.9	84	176.8	50.7	34	224.9	64.5	84	273.0	78.3
35	33.6	09.6	85	81.7	23.4	35	129.8	37.2	85	177.8	51.0	35	225.9	64.8	85	273.9	78.5
36	34.6	09.9	86	82.7	23.7	136	130.7	37.5	186	178.8	51.3	236	226.8	65.0	286	274.9	78.8
37	35.6	10.2	87	83.6	24.0	37	131.7	37.8	87	179.7	51.5	37	227.8	65.3	87	275.8	79.1
38	36.5	10.5	88	84.6	24.3	38	132.6	38.0	88	180.7	51.8	38	228.7	65.6	88	276.8	79.4
39	37.5	10.7	89	85.5	24.5	39	133.6	38.3	89	181.7	52.1	39	229.7	65.9	89	277.8	79.6
40	38.4	11.0	90	86.5	24.8	40	134.6	38.6	90	182.6	52.4	40	230.7	66.1	90	278.7	79.9
41	39.4	11.3	91	87.5	25.1	141	135.5	38.9	191	183.6	52.6	241	231.6	66.4	291	279.7	80.2
42	40.4	11.6	92	88.4	25.4	42	136.5	39.1	92	184.5	52.9	42	232.6	66.7	92	280.6	80.5
43	41.3	11.9	93	89.4	25.6	43	137.4	39.4	93	185.5	53.2	43	233.6	67.0	93	281.6	80.8
44	42.3	12.1	94	90.3	25.9	44	138.4	39.7	94	186.5	53.5	44	234.5	67.2	94	282.6	81.0
45	43.3	12.4	95	91.3	26.2	45	139.4	40.0	95	187.4	53.7	45	235.5	67.5	95	283.5	81.3
46	44.2	12.7	96	92.3	26.5	146	140.3	40.2	196	188.4	54.0	246	236.4	67.8	296	284.5	81.6
47	45.2	13.0	97	93.2	26.7	47	141.3	40.5	97	189.3	54.3	47	237.4	68.1	97	285.5	81.9
48	46.1	13.2	98	94.2	27.0	48	142.2	40.8	98	190.3	54.6	48	238.4	68.3	98	286.4	82.1
49	47.1	13.5	99	95.2	27.3	49	143.2	41.1	99	191.3	54.8	49	239.3	68.6	99	287.4	82.4
50	48.1	13.8	100	96.1	27.6	150	144.2	41.3	200	192.2	55.1	250	240.3	68.9	300	288.3	82.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 74 Deg.

# *Difference of Latitude and Departure for 17 Deg.*

17

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	01.0	00.3	51	48.8	14.9	101	96.6	29.5	151	144.4	44.1	201	192.2	58.8	251	240.0	73.3
2	01.9	00.6	52	49.7	15.2	02	97.5	29.8	52	145.3	44.4	02	193.2	59.0	52	241.0	73.6
3	02.9	00.9	53	50.7	15.5	03	98.5	30.1	53	146.3	44.7	03	194.1	59.3	53	241.9	73.9
4	03.8	01.2	54	51.6	15.8	04	99.4	30.4	54	147.3	45.0	04	195.1	59.6	54	242.9	74.1
5	04.8	01.5	55	52.6	16.1	05	100.4	30.7	55	148.2	45.3	05	196.0	59.9	55	243.8	74.4
6	05.7	01.8	56	53.5	16.4	106	101.4	31.0	156	149.2	45.6	206	197.0	60.2	256	244.8	74.7
7	06.7	02.0	57	54.5	16.7	07	102.3	31.3	57	150.1	45.9	07	197.9	60.5	57	245.8	75.0
8	07.6	02.3	58	55.5	17.0	08	103.3	31.6	58	151.1	46.2	08	198.9	60.8	58	246.7	75.3
9	08.6	02.6	59	56.4	17.2	09	104.2	31.9	59	152.0	46.5	09	199.9	61.1	59	247.7	75.6
10	09.6	02.9	60	57.4	17.5	10	105.2	32.2	60	153.0	46.8	10	200.8	61.4	60	248.6	75.9
11	10.5	03.2	61	58.3	17.8	111	106.1	32.4	161	154.0	47.1	211	201.8	61.7	261	249.6	76.2
12	11.5	03.5	62	59.3	18.1	12	107.1	32.7	62	154.9	47.4	12	202.7	62.0	62	250.5	76.5
13	12.4	03.8	63	60.2	18.4	13	108.1	33.0	63	155.9	47.6	13	203.7	62.3	63	251.5	76.8
14	13.4	04.1	64	61.2	18.7	14	109.0	33.3	64	156.8	47.9	14	204.6	62.6	64	252.4	77.1
15	14.3	04.4	65	62.2	19.0	15	110.0	33.6	65	157.8	48.2	15	205.6	62.8	65	253.4	77.4
16	15.3	04.7	66	63.1	19.3	116	110.9	33.9	166	158.7	48.5	216	206.5	63.1	266	254.4	77.7
17	16.3	05.0	67	64.1	19.6	17	111.9	34.2	67	159.7	48.8	17	207.5	63.4	67	255.3	77.9
18	17.2	05.3	68	65.0	19.9	18	112.8	34.5	68	160.6	49.1	18	208.5	63.7	68	256.3	78.2
19	18.2	05.6	69	66.0	20.2	19	113.8	34.8	69	161.6	49.4	19	209.4	64.0	69	257.2	78.5
20	19.1	05.8	70	66.9	20.5	20	114.7	35.1	70	162.6	49.7	20	210.4	64.3	70	258.2	78.8
21	20.1	06.1	71	67.9	20.8	121	115.7	35.4	171	163.5	50.0	221	211.3	64.6	271	259.1	79.1
22	21.0	06.4	72	68.8	21.0	22	116.7	35.7	72	164.5	50.3	22	212.3	64.9	72	260.1	79.4
23	22.0	06.7	73	69.8	21.3	23	117.6	36.0	73	165.4	50.6	23	213.2	65.2	73	261.1	79.7
24	22.9	07.0	74	70.8	21.6	24	118.6	36.2	74	166.4	50.9	24	214.2	65.5	74	262.0	80.0
25	23.9	07.3	75	71.7	21.9	25	119.5	36.5	75	167.3	51.2	25	215.2	65.8	75	263.0	80.3
26	24.9	07.6	76	72.7	22.2	126	120.5	36.8	176	168.3	51.4	226	216.1	66.1	276	263.9	80.6
27	25.8	07.9	77	73.6	22.5	27	121.4	37.1	77	169.3	51.7	27	217.1	66.4	77	264.9	80.9
28	26.8	08.2	78	74.6	22.8	28	122.4	37.4	78	170.2	52.0	28	218.0	66.6	78	265.8	81.2
29	27.7	08.5	79	75.5	23.1	29	123.4	37.7	79	171.2	52.3	29	219.0	66.9	79	266.8	81.5
30	28.7	08.8	80	76.5	23.4	30	124.3	38.0	80	172.1	52.6	30	219.9	67.2	80	267.7	81.7
31	29.6	09.1	81	77.5	23.7	131	125.3	38.3	181	173.1	52.9	231	220.9	67.5	281	268.7	82.0
32	30.6	09.4	82	78.4	24.0	32	126.2	38.6	82	174.0	53.2	32	221.8	67.8	82	269.7	82.3
33	31.6	09.6	83	79.4	24.3	33	127.2	38.9	83	175.0	53.5	33	222.8	68.1	83	270.6	82.6
34	32.5	09.9	84	80.3	24.6	34	128.1	39.2	84	175.9	53.8	34	223.8	68.4	84	271.6	82.9
35	33.5	10.2	85	81.3	24.8	35	129.1	39.5	85	176.9	54.1	35	224.7	68.7	85	272.5	83.2
36	34.4	10.5	86	82.2	25.1	136	130.0	39.8	186	177.9	54.4	236	225.7	69.0	286	273.5	83.5
37	35.4	10.8	87	83.2	25.4	37	131.0	40.0	87	178.8	54.7	37	226.6	69.3	87	274.4	83.8
38	36.3	11.1	88	84.1	25.7	38	132.0	40.3	88	179.8	55.0	38	227.6	69.6	88	275.4	84.1
39	37.3	11.4	89	85.1	26.0	39	132.9	40.6	89	180.7	55.2	39	228.5	69.9	89	276.4	84.4
40	38.2	11.7	90	86.1	26.3	40	133.9	40.9	90	181.7	55.5	40	229.5	70.2	90	277.3	84.7
41	39.2	12.0	91	87.0	26.6	141	134.8	41.2	191	182.6	55.8	241	230.5	70.4	291	278.3	85.0
42	40.2	12.3	92	88.0	26.9	42	135.8	41.5	92	183.6	56.1	42	231.4	70.7	92	279.2	85.3
43	41.1	12.6	93	88.9	27.2	43	136.7	41.8	93	184.6	56.4	43	232.4	71.0	93	280.2	85.5
44	42.1	12.9	94	89.9	27.5	44	137.7	42.1	94	185.5	56.7	44	233.3	71.3	94	281.1	85.8
45	43.0	13.2	95	90.8	27.8	45	138.7	42.4	95	186.5	57.0	45	234.3	71.6	95	282.1	86.1
46	44.0	13.4	96	91.8	28.1	146	139.6	42.7	196	187.4	57.3	246	235.2	71.9	296	283.0	86.4
47	44.9	13.7	97	92.8	28.4	47	140.6	43.0	97	188.4	57.6	47	236.2	72.1	97	284.0	86.7
48	45.9	14.0	98	93.7	28.6	48	141.5	43.3	98	189.3	57.9	48	237.1	72.4	98	285.0	87.0
49	46.9	14.3	99	94.7	28.9	49	142.5	43.6	99	190.3	58.2	49	238.1	72.7	99	285.9	87.3
50	47.8	14.6	100	95.6	29.2	150	143.4	43.8	200	191.2	58.5	250	239.1	73.0	300	286.9	87.6
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

*for 73 Deg.*



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.3	51	48.5	15.8	101	96.1	31.2	151	143.6	46.7	201	191.2	62.1	251	238.7	77.6
2	01.9	00.6	52	49.5	16.1	02	97.0	31.5	52	144.6	47.0	02	192.1	62.4	52	239.7	77.9
3	02.9	00.9	53	50.4	16.4	03	98.0	31.8	53	145.5	47.3	03	193.1	62.7	53	240.6	78.2
4	03.8	01.2	54	51.4	16.7	04	98.9	32.1	54	146.5	47.6	04	194.0	63.0	54	241.6	78.5
5	04.8	01.5	55	52.3	17.0	05	99.9	32.4	55	147.4	47.9	05	195.0	63.3	55	242.5	78.8
6	05.7	01.9	56	53.3	17.3	106	100.8	32.8	156	148.4	48.2	206	195.9	63.7	256	243.5	79.1
7	06.7	02.2	57	54.2	17.6	07	101.8	33.1	57	149.3	48.5	07	196.9	64.0	57	244.4	79.4
8	07.6	02.5	58	55.2	17.9	08	102.7	33.4	58	150.3	48.8	08	197.8	64.3	58	245.4	79.7
9	08.6	02.8	59	56.1	18.2	09	103.7	33.7	59	151.2	49.1	09	198.8	64.6	59	246.3	80.0
10	09.5	03.1	60	57.1	18.5	10	104.6	34.0	60	152.2	49.4	10	199.7	64.9	60	247.3	80.3
11	10.5	03.4	61	58.0	18.8	111	105.6	34.3	161	153.1	49.7	211	200.7	65.2	261	248.2	80.6
12	11.4	03.7	62	59.0	19.2	12	106.5	34.6	62	154.1	50.1	12	201.6	65.5	62	249.2	81.0
13	12.4	04.0	63	59.9	19.5	13	107.5	34.9	63	155.0	50.4	13	202.6	65.8	63	250.1	81.3
14	13.3	04.3	64	60.9	19.8	14	108.4	35.2	64	156.0	50.7	14	203.5	66.1	64	251.1	81.6
15	14.3	04.6	65	61.8	20.1	15	109.4	35.5	65	156.9	51.0	15	204.5	66.4	65	252.0	81.9
16	15.2	04.9	66	62.8	20.4	116	110.3	35.8	166	157.9	51.3	216	205.4	66.7	266	253.0	82.2
17	16.2	05.3	67	63.7	20.7	17	111.3	36.2	67	158.8	51.6	17	206.4	67.1	67	253.9	82.5
18	17.1	05.6	68	64.7	21.0	18	112.2	36.5	68	159.8	51.9	18	207.3	67.4	68	254.9	82.8
19	18.1	05.9	69	65.6	21.3	19	113.2	36.8	69	160.7	52.2	19	208.3	67.7	69	255.8	83.1
20	19.0	06.2	70	66.6	21.6	20	114.1	37.1	70	161.7	52.5	20	209.2	68.0	70	256.8	83.4
21	20.0	06.5	71	67.5	21.9	121	115.1	37.4	171	162.6	52.8	221	210.2	68.3	271	257.7	83.7
22	20.9	06.8	72	68.5	22.2	22	116.0	37.7	72	163.6	53.1	22	211.1	68.6	72	258.7	84.0
23	21.9	07.1	73	69.4	22.6	23	117.0	38.0	73	164.5	53.5	23	212.1	68.9	73	259.6	84.4
24	22.8	07.4	74	70.4	22.9	24	117.9	38.3	74	165.5	53.8	24	213.0	69.2	74	260.6	84.7
25	23.8	07.7	75	71.3	23.2	25	118.9	38.6	75	166.4	54.1	25	214.0	69.5	75	261.5	85.0
26	24.7	08.0	76	72.3	23.5	126	119.8	38.9	176	167.4	54.4	226	214.9	69.8	276	262.5	85.3
27	25.7	08.3	77	73.2	23.8	27	120.8	39.2	77	168.3	54.7	27	215.9	70.1	77	263.4	85.6
28	26.6	08.7	78	74.2	24.1	28	121.7	39.6	78	169.3	55.0	28	216.8	70.5	78	264.4	85.9
29	27.6	09.0	79	75.1	24.4	29	122.7	39.9	79	170.2	55.3	29	217.8	70.8	79	265.3	86.2
30	28.5	09.3	80	76.1	24.7	30	123.6	40.2	80	171.2	55.6	30	218.7	71.1	80	266.3	86.5
31	29.5	09.6	81	77.0	25.0	131	124.6	40.5	181	172.1	55.9	231	219.7	71.4	281	267.2	86.8
32	30.4	09.9	82	78.0	25.3	32	125.5	40.8	82	173.1	56.2	32	220.6	71.7	82	268.2	87.1
33	31.4	10.2	83	78.9	25.6	33	126.5	41.1	83	174.0	56.5	33	221.6	72.0	83	269.1	87.4
34	32.3	10.5	84	79.9	26.0	34	127.4	41.4	84	175.0	56.8	34	222.5	72.3	84	270.1	87.8
35	33.3	10.8	85	80.8	26.3	35	128.4	41.7	85	175.9	57.2	35	223.5	72.6	85	271.0	88.1
36	34.2	11.1	86	81.8	26.6	136	129.3	42.0	186	176.9	57.5	236	224.4	72.9	286	272.0	88.4
37	35.2	11.4	87	82.7	26.9	37	130.3	42.3	87	177.8	57.8	37	225.4	73.2	87	272.9	88.7
38	36.1	11.7	88	83.7	27.2	38	131.2	42.6	88	178.8	58.1	38	226.3	73.5	88	273.9	89.0
39	37.1	12.1	89	84.6	27.5	39	132.2	43.0	89	179.7	58.4	39	227.3	73.9	89	274.8	89.3
40	38.0	12.4	90	85.6	27.8	40	133.1	43.3	90	180.7	58.7	40	228.2	74.2	90	275.8	89.6
41	39.0	12.7	91	86.5	28.1	141	134.1	43.6	191	181.6	59.0	241	229.2	74.5	291	276.7	89.9
42	39.9	13.0	92	87.5	28.4	42	135.0	43.9	92	182.6	59.3	42	230.1	74.8	92	277.7	90.2
43	40.9	13.3	93	88.4	28.7	43	136.0	44.2	93	183.5	59.6	43	231.1	75.1	93	278.6	90.5
44	41.8	13.6	94	89.4	29.0	44	136.9	44.5	94	184.5	59.9	44	232.0	75.4	94	279.6	90.8
45	42.8	13.9	95	90.3	29.4	45	137.9	44.8	95	185.4	60.3	45	233.0	75.7	95	280.5	91.2
46	43.7	14.2	96	91.3	29.7	146	138.8	45.1	196	186.4	60.6	246	233.9	76.0	296	281.5	91.5
47	44.7	14.5	97	92.2	30.0	47	139.8	45.4	97	187.3	60.9	47	234.9	76.3	97	282.4	91.8
48	45.6	14.8	98	93.2	30.3	48	140.7	45.7	98	188.3	61.2	48	235.8	76.6	98	283.4	92.1
49	46.6	15.1	99	94.1	30.6	49	141.7	46.0	99	189.2	61.5	49	236.8	76.9	99	284.3	92.4
50	47.6	15.5	100	95.1	30.9	150	142.7	46.4	200	190.2	61.8	250	237.8	77.3	300	285.3	92.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 72 Deg.

# Difference of Latitude and Departure for 19 Deg.

19

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.3	51	48.2	16.6	101	95.5	32.9	151	142.8	49.2	201	190.0	65.4	251	237.3	81.7
2	01.9	00.7	52	49.2	16.9	02	96.4	33.2	52	143.7	49.5	02	191.0	65.8	52	238.3	82.1
3	02.8	01.0	53	50.1	17.3	03	97.4	33.5	53	144.7	49.8	03	191.9	66.1	53	239.2	82.4
4	03.8	01.3	54	51.1	17.6	04	98.3	33.9	54	145.6	50.1	04	192.9	66.4	54	240.1	82.7
5	04.7	01.6	55	52.0	17.9	05	99.3	34.2	55	146.5	50.5	05	193.8	66.7	55	241.1	83.0
6	05.7	02.0	56	52.9	18.2	106	100.2	34.5	156	147.5	50.8	206	194.8	67.1	256	242.0	83.4
7	06.6	02.3	57	53.9	18.6	07	101.2	34.8	57	148.4	51.1	07	195.7	67.4	57	243.0	83.7
8	07.6	02.6	58	54.8	18.9	08	102.1	35.2	58	149.4	51.4	08	196.7	67.7	58	243.9	84.0
9	08.5	02.9	59	55.8	19.2	09	103.1	35.5	59	150.3	51.8	09	197.6	68.1	59	244.9	84.3
10	09.5	03.3	60	56.7	19.5	10	104.0	35.8	60	151.3	52.1	10	198.5	68.4	60	245.8	84.7
11	10.4	03.6	61	57.7	19.9	111	104.9	36.1	161	152.2	52.4	211	199.5	68.7	261	246.8	85.0
12	11.3	03.9	62	58.6	20.2	12	105.9	36.5	62	153.2	52.7	12	200.4	69.0	62	247.7	85.3
13	12.3	04.2	63	59.6	20.5	13	106.8	36.8	63	154.1	53.1	13	201.4	69.4	63	248.7	85.6
14	13.2	04.6	64	60.5	20.8	14	107.8	37.1	64	155.1	53.4	14	202.3	69.7	64	249.6	86.0
15	14.2	04.9	65	61.5	21.2	15	108.7	37.4	65	156.0	53.7	15	203.3	70.0	65	250.5	86.3
16	15.1	05.2	66	62.4	21.5	116	109.7	37.8	166	156.9	54.0	216	204.2	70.3	266	251.5	86.6
17	16.1	05.5	67	63.3	21.8	17	110.6	38.1	67	157.9	54.4	17	205.2	70.7	67	252.4	86.9
18	17.0	05.9	68	64.3	22.1	18	111.6	38.4	68	158.8	54.7	18	206.1	71.0	68	253.4	87.3
19	18.0	06.2	69	65.2	22.5	19	112.5	38.7	69	159.8	55.0	19	207.1	71.3	69	254.3	87.6
20	18.9	06.5	70	66.2	22.8	20	113.5	39.1	70	160.7	55.4	20	208.0	71.6	70	255.3	87.9
21	19.9	06.8	71	67.1	23.1	121	114.4	39.4	171	161.7	55.7	221	208.9	72.0	271	256.2	88.2
22	20.8	07.2	72	68.1	23.4	22	115.3	39.7	72	162.6	56.0	22	209.9	72.3	72	257.2	88.6
23	21.7	07.5	73	69.0	23.8	23	116.3	40.0	73	163.6	56.3	23	210.8	72.6	73	258.1	88.9
24	22.7	07.8	74	70.0	24.1	24	117.2	40.4	74	164.5	56.7	24	211.8	72.9	74	259.1	89.2
25	23.6	08.1	75	70.9	24.4	25	118.2	40.7	75	165.5	57.0	25	212.7	73.3	75	260.0	89.5
26	24.6	08.5	76	71.9	24.7	126	119.1	41.0	176	166.4	57.3	226	213.7	73.6	276	260.9	89.9
27	25.5	08.8	77	72.8	25.1	27	120.1	41.4	77	167.3	57.6	27	214.6	73.9	77	261.9	90.2
28	26.5	09.1	78	73.7	25.4	28	121.0	41.7	78	168.3	58.0	28	215.6	74.2	78	262.8	90.5
29	27.4	09.4	79	74.7	25.7	29	122.0	42.0	79	169.2	58.3	29	216.5	74.6	79	263.8	90.8
30	28.4	09.8	80	75.6	26.0	30	122.9	42.3	80	170.2	58.6	30	217.5	74.9	80	264.7	91.2
31	29.3	10.1	81	76.6	26.4	131	123.9	42.7	181	171.1	58.9	231	218.4	75.2	281	265.7	91.5
32	30.3	10.4	82	77.5	26.7	32	124.8	43.0	82	172.1	59.3	32	219.3	75.5	82	266.6	91.8
33	31.2	10.7	83	78.5	27.0	33	125.7	43.3	83	173.0	59.6	33	220.3	75.9	83	267.6	92.1
34	32.1	11.1	84	79.4	27.4	34	126.7	43.6	84	174.0	59.9	34	221.2	76.2	84	268.5	92.5
35	33.1	11.4	85	80.4	27.7	35	127.6	44.0	85	174.9	60.2	35	222.2	76.5	85	269.5	92.8
36	34.0	11.7	86	81.3	28.0	136	128.6	44.3	186	175.9	60.6	236	223.1	76.8	286	270.4	93.1
37	35.0	12.0	87	82.3	28.3	37	129.5	44.6	87	176.8	60.9	37	224.1	77.2	87	271.3	93.4
38	35.9	12.4	88	83.2	28.7	38	130.5	44.9	88	177.7	61.2	38	225.0	77.5	88	272.3	93.8
39	36.9	12.7	89	84.1	29.0	39	131.4	45.3	89	178.7	61.5	39	226.0	77.8	89	273.2	94.1
40	37.8	13.0	90	85.1	29.3	40	132.4	45.6	90	179.6	61.9	40	226.9	78.1	90	274.2	94.4
41	38.8	13.3	91	86.0	29.6	141	133.3	45.9	191	180.6	62.2	241	227.9	78.5	291	275.1	94.7
42	39.7	13.7	92	87.0	30.0	42	134.3	46.2	92	181.5	62.5	42	228.8	78.8	92	276.1	95.1
43	40.7	14.0	93	87.9	30.3	43	135.2	46.6	93	182.5	62.8	43	229.7	79.1	93	277.0	95.4
44	41.6	14.3	94	88.9	30.6	44	136.1	46.9	94	183.4	63.2	44	230.7	79.4	94	278.0	95.7
45	42.5	14.7	95	89.8	30.9	45	137.1	47.2	95	184.4	63.5	45	231.6	79.8	95	278.9	96.1
46	43.5	15.0	96	90.8	31.3	146	138.0	47.5	196	185.3	63.8	246	232.6	80.1	296	279.9	96.4
47	44.4	15.3	97	91.7	31.6	47	139.0	47.9	97	186.3	64.1	47	233.5	80.4	97	280.8	96.7
48	45.4	15.6	98	92.7	31.9	48	139.9	48.2	98	187.2	64.5	48	234.5	80.7	98	281.7	97.0
49	46.3	16.0	99	93.6	32.2	49	140.9	48.5	99	188.1	64.8	49	235.4	81.1	99	282.7	97.4
50	47.3	16.3	100	94.5	32.6	150	141.8	48.8	200	189.1	65.1	250	236.4	81.4	300	283.6	97.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 71 Deg.



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.3	51	47.9	17.4	101	94.9	34.5	151	141.9	51.6	201	188.9	68.7	251	235.9	85.8
2	01.9	00.7	52	48.9	17.8	02	95.8	34.9	52	142.8	52.0	02	189.8	69.1	52	236.8	86.2
3	02.8	01.0	53	49.8	18.1	03	96.8	35.2	53	143.8	52.3	03	190.8	69.4	53	237.7	86.5
4	03.8	01.4	54	50.7	18.5	04	97.7	35.6	54	144.7	52.7	04	191.7	69.8	54	238.7	86.9
5	04.7	01.7	55	51.7	18.8	05	98.7	35.9	55	145.7	53.0	05	192.6	70.1	55	239.6	87.2
6	05.6	02.1	56	52.6	19.2	106	99.6	36.3	156	146.6	53.4	206	193.6	70.5	256	240.6	87.6
7	06.6	02.4	57	53.6	19.5	07	100.5	36.6	57	147.5	53.7	07	194.5	70.8	57	241.5	87.9
8	07.5	02.7	58	54.5	19.8	08	101.5	36.9	58	148.5	54.0	08	195.5	71.1	58	242.4	88.2
9	08.5	03.1	59	55.4	20.2	09	102.4	37.3	59	149.4	54.4	09	196.4	71.5	59	243.4	88.6
10	09.4	03.4	60	56.4	20.5	10	103.4	37.6	60	150.4	54.7	10	197.3	71.8	60	244.3	88.9
11	10.3	03.8	61	57.3	20.9	111	104.3	38.0	161	151.3	55.1	211	198.3	72.2	261	245.3	89.3
12	11.3	04.1	62	58.3	21.2	12	105.2	38.3	62	152.2	55.4	12	199.2	72.5	62	246.2	89.6
13	12.2	04.4	63	59.2	21.5	13	106.2	38.6	63	153.2	55.7	13	200.2	72.8	63	247.1	89.9
14	13.2	04.8	64	60.1	21.9	14	107.1	39.0	64	154.1	56.1	14	201.1	73.2	64	248.1	90.3
15	14.1	05.1	65	61.1	22.2	15	108.1	39.3	65	155.1	56.4	15	202.0	73.5	65	249.0	90.6
16	15.0	05.5	66	62.0	22.6	116	109.0	39.7	166	156.0	56.8	216	203.0	73.9	266	250.0	91.0
17	16.0	05.8	67	63.0	22.9	17	109.9	40.0	67	156.9	57.1	17	203.9	74.2	67	250.9	91.3
18	16.9	06.2	68	63.9	23.3	18	110.9	40.4	68	157.9	57.5	18	204.9	74.6	68	251.8	91.7
19	17.9	06.5	69	64.8	23.6	19	111.8	40.7	69	158.8	57.8	19	205.8	74.9	69	252.8	92.0
20	18.8	06.8	70	65.8	23.9	20	112.8	41.0	70	159.7	58.1	20	206.7	75.2	70	253.7	92.3
21	19.7	07.2	71	66.7	24.3	121	113.7	41.4	171	160.7	58.5	221	207.7	75.6	271	254.7	92.7
22	20.7	07.5	72	67.7	24.6	22	114.6	41.7	72	161.6	58.8	22	208.6	75.9	72	255.6	93.0
23	21.6	07.9	73	68.6	25.0	23	115.6	42.1	73	162.6	59.2	23	209.6	76.3	73	256.5	93.4
24	22.6	08.2	74	69.5	25.3	24	116.5	42.4	74	163.5	59.5	24	210.5	76.6	74	257.5	93.7
25	23.5	08.6	75	70.5	25.7	25	117.5	42.8	75	164.4	59.9	25	211.4	77.0	75	258.4	94.1
26	24.4	08.9	76	71.4	26.0	126	118.4	43.1	176	165.4	60.2	226	212.4	77.3	276	259.4	94.4
27	25.4	09.2	77	72.4	26.3	27	119.3	43.4	77	166.3	60.5	27	213.3	77.6	77	260.3	94.7
28	26.3	09.6	78	73.3	26.7	28	120.3	43.8	78	167.3	60.9	28	214.3	78.0	78	261.2	95.1
29	27.3	09.9	79	74.2	27.0	29	121.2	44.1	79	168.2	61.2	29	215.2	78.3	79	262.2	95.4
30	28.2	10.3	80	75.2	27.4	30	122.2	44.5	80	169.1	61.6	30	216.1	78.7	80	263.1	95.8
31	29.1	10.6	81	76.1	27.7	131	123.1	44.8	181	170.1	61.9	231	217.1	79.0	281	264.1	96.1
32	30.1	10.9	82	77.1	28.0	32	124.0	45.1	82	171.0	62.2	32	218.0	79.3	82	265.0	96.4
33	31.0	11.3	83	78.0	28.4	33	125.0	45.5	83	172.0	62.6	33	219.0	79.7	83	265.9	96.8
34	31.9	11.6	84	78.9	28.7	34	125.9	45.8	84	172.9	62.9	34	219.9	80.0	84	266.9	97.1
35	32.9	12.0	85	79.9	29.1	35	126.9	46.2	85	173.8	63.3	35	220.8	80.4	85	267.8	97.5
36	33.8	12.3	86	80.8	29.4	136	127.8	46.5	186	174.8	63.6	236	221.8	80.7	286	268.8	97.8
37	34.8	12.7	87	81.8	29.8	37	128.7	46.9	87	175.7	64.0	37	222.7	81.1	87	269.7	98.2
38	35.7	13.0	88	82.7	30.1	38	129.7	47.2	88	176.7	64.3	38	223.6	81.4	88	270.6	98.5
39	36.6	13.3	89	83.6	30.4	39	130.6	47.5	89	177.6	64.6	39	224.6	81.7	89	271.6	98.8
40	37.6	13.7	90	84.6	30.8	40	131.6	47.9	90	178.5	65.0	40	225.5	82.1	90	272.5	99.2
41	38.5	14.0	91	85.5	31.1	141	132.5	48.2	191	179.5	65.3	241	226.5	82.4	291	273.5	99.5
42	39.5	14.4	92	86.5	31.5	42	133.4	48.6	92	180.4	65.7	42	227.4	82.8	92	274.4	99.9
43	40.4	14.7	93	87.4	31.8	43	134.4	48.9	93	181.4	66.0	43	228.3	83.1	93	275.3	100.2
44	41.3	15.0	94	88.3	32.1	44	135.3	49.2	94	182.3	66.4	44	229.3	83.4	94	276.3	100.5
45	42.3	15.4	95	89.3	32.5	45	136.3	49.6	95	183.2	66.7	45	230.2	83.8	95	277.2	100.9
46	43.2	15.7	96	90.2	32.8	146	137.2	49.9	196	184.2	67.0	246	231.2	84.1	296	278.2	101.1
47	44.2	16.1	97	91.2	33.2	47	138.1	50.3	97	185.1	67.4	47	232.1	84.5	97	279.1	101.6
48	45.1	16.4	98	92.1	33.5	48	139.1	50.6	98	186.1	67.7	48	233.0	84.8	98	280.0	101.9
49	46.0	16.8	99	93.0	33.9	49	140.0	51.0	99	187.0	68.1	49	234.0	85.2	99	281.0	102.3
50	47.0	17.1	100	94.0	34.2	150	141.0	51.3	200	187.9	68.4	250	234.9	85.5	300	281.9	102.6
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 70 Deg.

# Difference of Latitude and Departure for 21 Deg.

21

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.4	51	47.6	18.3	101	94.3	36.2	151	141.0	54.1	201	187.6	72.0	251	234.3	90.0
2	01.9	00.7	52	48.5	18.6	02	95.3	36.6	52	141.9	54.5	02	188.6	72.4	52	235.3	90.3
3	02.8	01.1	53	49.5	19.0	03	96.2	36.9	53	142.9	54.8	03	189.5	72.8	53	236.2	90.7
4	03.7	01.4	54	50.4	19.4	04	97.1	37.3	54	143.8	55.2	04	190.4	73.1	54	237.1	91.0
5	04.7	01.8	55	51.3	19.7	05	98.0	37.6	55	144.7	55.6	05	191.4	73.5	55	238.1	91.4
6	05.6	02.2	56	52.3	20.1	106	99.0	38.0	156	145.7	55.9	206	192.3	73.8	256	239.0	91.8
7	06.5	02.5	57	53.2	20.4	07	99.9	38.3	57	146.6	56.3	07	193.2	74.2	57	239.9	92.1
8	07.5	02.9	58	54.1	20.8	08	100.9	38.7	58	147.5	56.6	08	194.2	74.5	58	240.9	92.5
9	08.4	03.2	59	55.1	21.1	09	101.8	39.1	59	148.5	57.0	09	195.1	74.9	59	241.8	92.8
10	09.3	03.6	60	56.0	21.5	10	102.7	39.4	60	149.4	57.3	10	196.0	75.3	60	242.7	93.2
11	10.3	03.9	61	56.9	21.9	111	103.7	39.8	161	150.3	57.7	211	197.0	75.6	261	243.7	93.5
12	11.2	04.3	62	57.9	22.2	12	104.6	40.1	62	151.3	58.1	12	197.9	76.0	62	244.6	93.9
13	12.1	04.7	63	58.8	22.6	13	105.5	40.5	63	152.2	58.4	13	198.8	76.3	63	245.5	94.3
14	13.1	05.0	64	59.7	22.9	14	106.5	40.9	64	153.1	58.8	14	199.8	76.7	64	246.5	94.6
15	14.0	05.4	65	60.7	23.3	15	107.4	41.2	65	154.1	59.1	15	200.7	77.1	65	247.4	95.0
16	14.9	05.7	66	61.6	23.7	116	108.3	41.6	166	155.0	59.5	216	201.6	77.4	266	248.3	95.3
17	15.9	06.1	67	62.5	24.0	17	109.3	41.9	67	155.9	59.9	17	202.6	77.8	67	249.3	95.7
18	16.8	06.5	68	63.5	24.4	18	110.2	42.3	68	156.9	60.2	18	203.5	78.1	68	250.2	96.1
19	17.7	06.8	69	64.4	24.7	19	111.1	42.6	69	157.8	60.6	19	204.4	78.5	69	251.1	96.4
20	18.7	07.2	70	65.3	25.1	20	112.1	43.0	70	158.7	60.9	20	205.4	78.8	70	252.1	96.8
21	19.6	07.5	71	66.3	25.4	121	113.0	43.4	171	159.7	61.3	221	206.3	79.2	271	253.0	97.1
22	20.5	07.9	72	67.2	25.8	22	113.9	43.7	72	160.6	61.6	22	207.2	79.6	72	253.9	97.5
23	21.5	08.2	73	68.1	26.2	23	114.9	44.1	73	161.5	62.0	23	208.2	79.9	73	254.9	97.8
24	22.4	08.6	74	69.1	26.5	24	115.8	44.4	74	162.5	62.4	24	209.1	80.3	74	255.8	98.2
25	23.3	09.0	75	70.0	16.9	25	116.7	44.8	75	163.4	62.7	25	210.0	80.6	75	256.7	98.6
26	24.3	09.3	76	70.9	27.2	126	117.7	45.2	176	164.3	63.1	226	211.0	81.0	276	257.7	98.9
27	25.2	09.7	77	71.9	27.6	27	118.6	45.5	77	165.3	63.4	27	211.9	81.4	77	258.6	99.3
28	26.1	10.0	78	72.8	28.0	28	119.5	45.9	78	166.2	63.8	28	212.8	81.7	78	259.5	99.6
29	27.1	10.4	79	73.7	28.3	29	120.5	46.2	79	167.1	64.2	29	213.8	82.1	79	260.5	100.0
30	28.0	10.8	80	74.7	28.7	30	121.4	46.6	80	168.1	64.5	30	214.7	82.4	80	261.4	100.4
31	28.9	11.1	81	75.6	29.0	131	122.3	47.0	181	169.0	64.9	231	215.6	82.8	281	262.3	100.7
32	29.9	11.5	82	76.5	29.4	32	123.3	47.3	82	169.9	65.2	32	216.6	83.1	82	263.3	101.1
33	30.8	11.8	83	77.5	29.7	33	124.2	47.7	83	170.9	65.6	33	217.5	83.5	83	264.2	101.4
34	31.7	12.2	84	78.4	30.1	34	125.1	48.0	84	171.8	65.9	34	218.4	83.9	84	265.1	101.8
35	32.7	12.5	85	79.3	30.5	35	126.1	48.4	85	172.7	66.3	35	219.4	84.2	85	266.1	102.1
36	33.6	12.9	86	80.3	30.8	136	127.0	48.7	186	173.7	66.7	236	220.3	84.6	286	267.0	102.5
37	34.5	13.3	87	81.2	31.2	37	127.9	49.1	87	174.6	67.0	37	221.2	84.9	87	267.9	102.9
38	35.5	13.6	88	82.1	31.5	38	128.9	49.5	88	175.5	67.4	38	222.2	85.3	88	268.9	103.2
39	36.4	14.0	89	83.1	31.9	39	129.8	49.8	89	176.5	67.7	39	223.1	85.7	89	269.8	103.6
40	37.3	14.3	90	84.0	32.3	40	130.7	50.2	90	177.4	68.1	40	224.1	86.0	90	270.7	103.9
41	38.3	14.7	91	84.9	32.6	141	131.7	50.5	191	178.3	68.5	241	225.0	86.4	291	271.7	104.3
42	39.2	15.1	92	85.9	33.0	42	132.6	50.9	92	179.3	68.8	42	225.9	86.7	92	272.6	104.7
43	40.1	15.4	93	86.8	33.3	43	133.5	51.3	93	180.2	69.2	43	226.9	87.1	93	273.5	105.0
44	41.1	15.8	94	87.7	33.7	44	134.5	51.6	94	181.1	69.5	44	227.8	87.4	94	274.5	105.4
45	42.0	16.1	95	88.7	34.0	45	135.4	52.0	95	182.1	69.9	45	228.7	87.8	95	275.4	105.7
46	42.9	16.5	96	89.6	34.4	146	136.3	52.3	196	183.0	70.2	246	229.7	88.2	296	276.3	106.1
47	43.9	16.8	97	90.5	34.8	47	137.3	52.7	97	183.9	70.6	47	230.6	88.5	97	277.3	106.4
48	44.8	17.2	98	91.5	35.1	48	138.2	53.0	98	184.9	71.0	48	231.5	88.9	98	278.2	106.8
49	45.7	17.6	99	92.4	35.5	49	139.1	53.4	99	185.8	71.3	49	232.5	89.2	99	279.1	107.2
50	46.7	17.9	100	93.4	35.8	150	140.1	53.8	200	186.7	71.7	250	233.4	89.6	300	280.1	107.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 69 Deg.



22 *Difference of Latitude and Departure for 22 Deg.*

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.9	00.4	51	47.3	19.1	101	93.6	37.8	151	140.0	56.6	201	186.4	75.3	251	232.7	94.0
2	01.9	00.7	52	48.2	19.5	02	94.6	38.2	52	140.9	56.9	02	187.3	75.7	52	233.7	94.4
3	02.8	01.1	53	49.1	19.9	03	95.5	38.6	53	141.9	57.3	03	188.2	76.0	53	234.6	94.8
4	03.7	01.5	54	50.1	20.2	04	96.4	39.0	54	142.8	57.7	04	189.1	76.4	54	235.5	95.2
5	04.6	01.9	55	51.0	20.6	05	97.4	39.3	55	143.7	58.1	05	190.1	76.8	55	236.4	95.5
6	05.6	02.2	56	51.9	21.0	106	98.3	39.7	156	144.6	58.4	206	191.0	77.2	256	237.4	95.9
7	06.5	02.6	57	52.9	21.4	07	99.2	40.1	57	145.6	58.8	07	191.9	77.5	57	238.3	96.3
8	07.4	03.0	58	53.8	21.7	08	100.1	40.5	58	146.5	59.2	08	192.9	77.9	58	239.2	96.6
9	08.3	03.4	59	54.7	22.1	09	101.1	40.8	59	147.4	59.6	09	193.8	78.3	59	240.1	97.0
10	09.3	03.7	60	55.6	22.5	10	102.0	41.2	60	148.4	59.9	10	194.7	78.7	60	241.1	97.4
11	10.2	04.1	61	56.6	22.9	111	102.9	41.6	161	149.3	60.3	211	195.6	79.0	261	242.0	97.8
12	11.1	04.5	62	57.5	23.2	12	103.8	42.0	62	150.2	60.7	12	196.6	79.4	62	242.9	98.1
13	12.1	04.9	63	58.4	23.6	13	104.8	42.3	63	151.1	61.1	13	197.5	79.8	63	243.9	98.5
14	13.0	05.2	64	59.3	24.0	14	105.7	42.7	64	152.1	61.4	14	198.4	80.2	64	244.8	98.9
15	13.9	05.6	65	60.3	24.3	15	106.6	43.1	65	153.0	61.8	15	199.3	80.5	65	245.7	99.3
16	14.8	06.0	66	61.2	24.7	116	107.6	43.5	166	153.9	62.2	216	200.3	80.9	266	246.6	99.6
17	15.8	06.4	67	62.1	25.1	17	108.5	43.8	67	154.8	62.6	17	201.2	81.3	67	247.6	100.0
18	16.7	06.7	68	63.0	25.5	18	109.4	44.2	68	155.8	62.9	18	202.1	81.7	68	248.5	100.4
19	17.6	07.1	69	64.0	25.8	19	110.3	44.6	69	156.7	63.3	19	203.1	82.0	69	249.4	100.8
20	18.5	07.5	70	64.9	26.2	20	111.3	45.0	70	157.6	63.7	20	204.0	82.4	70	250.3	101.1
21	19.5	07.9	71	65.8	26.6	121	112.2	45.3	171	158.6	64.1	221	204.9	82.8	271	251.3	101.5
22	20.4	08.2	72	66.8	27.0	22	113.1	45.7	72	159.5	64.4	22	205.8	83.2	72	252.2	101.9
23	21.3	08.6	73	67.7	27.3	23	114.0	46.1	73	160.4	64.8	23	206.7	83.5	73	253.1	102.3
24	22.3	09.0	74	68.6	27.7	24	115.0	46.5	74	161.3	65.2	24	207.7	83.9	74	254.1	102.6
25	23.2	09.4	75	69.5	28.1	25	115.9	46.8	75	162.3	65.6	25	208.6	84.3	75	255.0	103.0
26	24.1	09.7	76	70.5	28.5	126	116.8	47.2	176	163.2	65.9	226	209.5	84.7	276	255.9	103.4
27	25.0	10.1	77	71.4	28.8	27	117.8	47.6	77	164.1	66.3	27	210.5	85.0	77	256.8	103.8
28	26.0	10.5	78	72.3	29.2	28	118.7	47.9	78	165.0	66.7	28	211.4	85.4	78	257.8	104.1
29	26.9	10.9	79	73.2	29.6	29	119.6	48.3	79	166.0	67.1	29	212.3	85.8	79	258.7	104.5
30	27.8	11.2	80	74.2	30.0	30	120.5	48.7	80	166.9	67.4	30	213.3	86.2	80	259.6	104.9
31	28.7	11.6	81	75.1	30.3	131	121.5	49.1	181	167.8	67.8	231	214.2	86.5	281	260.5	105.3
32	29.7	12.0	82	76.0	30.7	32	122.4	49.4	82	168.8	68.2	32	215.1	86.9	82	261.5	105.6
33	30.6	12.4	83	77.0	31.1	33	123.3	49.8	83	169.7	68.6	33	216.0	87.3	83	262.4	106.0
34	31.5	12.7	84	77.9	31.5	34	124.2	50.2	84	170.6	68.9	34	217.0	87.7	84	263.3	106.4
35	32.5	13.1	85	78.8	31.8	35	125.2	50.6	85	171.5	69.3	35	217.9	88.0	85	264.3	106.8
36	33.4	13.5	86	79.7	32.2	136	126.1	50.9	186	172.5	69.7	236	218.8	88.4	286	265.2	107.1
37	34.3	13.9	87	80.7	32.6	37	127.0	51.3	87	173.4	70.1	37	219.7	88.8	87	266.1	107.5
38	35.2	14.2	88	81.6	33.0	38	128.0	51.7	88	174.3	70.4	38	220.7	89.2	88	267.0	107.9
39	36.2	14.6	89	82.5	33.3	39	128.9	52.1	89	175.2	70.8	39	221.6	89.5	89	268.0	108.3
40	37.1	15.0	90	83.4	33.7	40	129.8	52.4	90	176.2	71.2	40	222.5	89.9	90	268.9	108.6
41	38.0	15.4	91	84.4	34.1	141	130.7	52.8	191	177.1	71.5	241	223.5	90.3	291	269.8	109.0
42	38.9	15.7	92	85.3	34.5	42	131.7	53.2	92	178.0	71.9	42	224.4	90.7	92	270.7	109.4
43	39.9	16.1	93	86.2	34.8	43	132.6	53.6	93	178.9	72.3	43	225.3	91.0	93	271.7	109.8
44	40.8	16.5	94	87.2	35.2	44	133.5	53.9	94	179.8	72.7	44	226.2	91.4	94	272.6	110.1
45	41.7	16.9	95	88.1	35.6	45	134.4	54.3	95	180.8	73.0	45	227.2	91.8	95	273.5	110.5
46	42.7	17.2	96	89.0	36.0	146	135.4	54.7	196	181.7	73.4	246	228.1	92.2	296	274.5	110.9
47	43.6	17.6	97	89.9	36.3	47	136.3	55.1	97	182.7	73.8	47	229.0	92.5	97	275.4	111.3
48	44.5	18.0	98	90.9	36.7	48	137.2	55.4	98	183.6	74.2	48	229.9	92.9	98	276.3	111.6
49	45.4	18.4	99	91.8	37.1	49	138.2	55.8	99	184.5	74.5	49	230.9	93.3	99	277.2	112.0
50	46.4	18.7	100	92.7	37.5	150	139.1	56.2	200	185.4	74.9	250	231.8	93.7	300	278.2	112.4
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

*for 68 Deg.*

# Difference of Latitude and Departure for 23 Deg.

23

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.4	51	46.9	19.9	101	93.0	39.5	151	139.0	59.0	201	185.0	78.5	251	231.0	98.1
2	01.8	00.8	52	47.9	20.3	02	93.9	39.9	52	139.9	59.4	02	185.9	78.9	52	232.0	98.5
3	02.8	01.2	53	48.8	20.7	03	94.8	40.2	53	140.8	59.8	03	186.9	79.3	53	232.9	98.8
4	03.7	01.6	54	49.7	21.1	04	95.7	40.6	54	141.8	60.2	04	187.8	79.7	54	233.8	99.2
5	04.6	02.0	55	50.6	21.5	05	96.7	41.0	55	142.7	60.6	05	188.7	80.1	55	234.7	99.6
6	05.5	02.3	56	51.5	21.9	106	97.6	41.4	156	143.6	60.9	206	189.6	80.5	256	235.6	100.0
7	06.4	02.7	57	52.5	22.3	07	98.5	41.8	57	144.5	61.3	07	190.5	80.9	57	236.6	100.4
8	07.4	03.1	58	53.4	22.7	08	99.4	42.2	58	145.4	61.7	08	191.5	81.3	58	237.5	100.8
9	08.3	03.5	59	54.3	23.1	09	100.3	42.6	59	146.4	62.1	09	192.4	81.7	59	238.4	101.2
10	09.2	03.9	60	55.2	23.4	10	101.3	43.0	60	147.3	62.5	10	193.3	82.0	60	239.3	101.6
11	10.1	04.3	61	56.1	23.8	111	102.2	43.4	161	148.2	62.9	211	194.2	82.4	261	240.2	102.0
12	11.0	04.7	62	57.1	24.2	12	103.1	43.8	62	149.1	63.3	12	195.1	82.8	62	241.2	102.4
13	12.0	05.1	63	58.0	24.6	13	104.0	44.1	63	150.0	63.7	13	196.1	83.2	63	242.1	102.8
14	12.9	05.5	64	58.9	25.0	14	104.9	44.5	64	151.0	64.1	14	197.0	83.6	64	243.0	103.1
15	13.8	05.9	65	59.8	25.4	15	105.9	44.9	65	151.9	64.5	15	197.9	84.0	65	243.9	103.5
16	14.7	06.3	66	60.8	25.8	116	106.8	45.3	166	152.8	64.9	216	198.8	84.4	266	244.9	103.9
17	15.6	06.6	67	61.7	26.2	17	107.7	45.7	67	153.7	65.2	17	199.7	84.8	67	245.8	104.3
18	16.6	07.0	68	62.6	26.6	18	108.6	46.1	68	154.6	65.6	18	200.7	85.2	68	246.7	104.7
19	17.5	07.4	69	63.5	27.0	19	109.5	46.5	69	155.6	66.0	19	201.6	85.6	69	247.6	105.1
20	18.4	07.8	70	64.4	27.3	20	110.5	46.9	70	156.5	66.4	20	202.5	86.0	70	248.5	105.5
21	19.3	08.2	71	65.4	27.7	121	111.4	47.3	171	157.4	66.8	221	203.4	86.3	271	249.5	105.9
22	20.3	08.6	72	66.3	28.1	22	112.3	47.7	72	158.3	67.2	22	204.4	86.7	72	250.4	106.3
23	21.2	09.0	73	67.2	28.5	23	113.2	48.1	73	159.2	67.6	23	205.3	87.1	73	251.3	106.7
24	22.1	09.4	74	68.1	28.9	24	114.1	48.4	74	160.2	68.0	24	206.2	87.5	74	252.2	107.1
25	23.0	09.8	75	69.0	29.3	25	115.1	48.8	75	161.1	68.4	25	207.1	87.9	75	253.1	107.4
26	23.9	10.2	76	70.0	29.7	126	116.0	49.2	176	162.0	68.8	226	208.0	88.3	276	254.1	107.8
27	24.9	10.5	77	70.9	30.1	27	116.9	49.6	77	162.9	69.2	27	209.0	88.7	77	255.0	108.2
28	25.8	10.9	78	71.8	30.5	28	117.8	50.0	78	163.8	69.5	28	209.9	89.1	78	255.9	108.6
29	26.7	11.3	79	72.7	30.9	29	118.7	50.4	79	164.8	69.9	29	210.8	89.5	79	256.8	109.0
30	27.6	11.7	80	73.6	31.3	30	119.7	50.8	80	165.7	70.3	30	211.7	89.9	80	257.7	109.4
31	28.5	12.1	81	74.6	31.6	131	120.6	51.2	181	166.6	70.7	231	212.6	90.3	281	258.7	109.8
32	29.5	12.5	82	75.5	32.0	32	121.5	51.6	82	167.5	71.1	32	213.6	90.6	82	259.6	110.2
33	30.4	12.9	83	76.4	32.4	33	122.4	52.0	83	168.5	71.5	33	214.5	91.0	83	260.5	110.6
34	31.3	13.3	84	77.3	32.8	34	123.3	52.4	84	169.4	71.9	34	215.4	91.4	84	261.4	111.0
35	32.2	13.7	85	78.2	33.2	35	124.3	52.7	85	170.3	72.3	35	216.3	91.8	85	262.3	111.3
36	33.1	14.1	86	79.2	33.6	136	125.2	53.1	186	171.2	72.7	236	217.2	92.2	286	263.3	111.7
37	34.1	14.5	87	80.1	34.0	37	126.1	53.5	87	172.1	73.1	37	218.2	92.6	87	264.2	112.1
38	35.0	14.8	88	81.0	34.4	38	127.0	53.9	88	173.1	73.5	38	219.1	93.0	88	265.1	112.5
39	35.9	15.2	89	81.9	34.8	39	127.9	54.3	89	174.0	73.8	39	220.0	93.4	89	266.0	112.9
40	36.8	15.6	90	82.8	35.2	40	128.9	54.7	90	174.9	74.2	40	220.9	93.8	90	266.9	113.3
41	37.7	16.0	91	83.8	35.6	141	129.8	55.1	191	175.8	74.6	241	221.8	94.2	291	267.9	113.7
42	38.7	16.4	92	84.7	35.9	42	130.7	55.5	92	176.7	75.0	42	222.8	94.5	92	268.8	114.1
43	39.6	16.8	93	85.6	36.3	43	131.6	55.9	93	177.7	75.4	43	223.7	94.9	93	269.7	114.5
44	40.5	17.2	94	86.5	36.7	44	132.6	56.3	94	178.6	75.8	44	224.6	95.3	94	270.6	114.9
45	41.4	17.6	95	87.4	37.1	45	133.5	56.7	95	179.5	76.2	45	225.5	95.7	95	271.5	115.3
46	42.3	18.0	96	88.4	37.5	146	134.4	57.0	196	180.4	76.6	246	226.4	96.1	296	272.5	115.6
47	43.3	18.4	97	89.3	37.9	47	135.3	57.4	97	181.3	77.0	47	227.4	96.5	97	273.4	116.0
48	44.2	18.8	98	90.2	38.3	48	136.2	57.8	98	182.3	77.4	48	228.3	96.9	98	274.3	116.4
49	45.1	19.1	99	91.1	38.7	49	137.2	58.2	99	183.2	77.7	49	229.2	97.3	99	275.2	116.8
50	46.0	19.5	100	92.0	39.1	150	138.1	58.6	200	184.1	78.1	250	230.1	97.7	300	276.2	117.2
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 67 Deg.



24 : *Difference of Latitude and Departure for 24 Deg.*

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.4	51	46.6	20.7	101	92.3	41.1	151	137.9	61.4	201	183.6	81.7	251	229.3	102.1
2	01.8	00.8	52	47.5	21.1	02	93.2	41.5	52	138.9	61.8	02	184.5	82.2	52	230.2	102.5
3	02.7	01.2	53	48.4	21.6	03	94.1	41.9	53	139.8	62.2	03	185.4	82.6	53	231.1	102.9
4	03.7	01.6	54	49.3	22.0	04	95.0	42.3	54	140.7	62.6	04	186.4	83.0	54	232.0	103.3
5	04.6	02.0	55	50.2	22.4	05	95.9	42.7	55	141.6	63.0	05	187.3	83.4	55	232.9	103.7
6	05.5	02.4	56	51.2	22.8	106	96.8	43.1	156	142.5	63.4	206	188.2	83.8	256	233.9	104.1
7	06.4	02.8	57	52.1	23.2	07	97.7	43.5	57	143.4	63.9	07	189.1	84.2	57	234.8	104.5
8	07.3	03.3	58	53.0	23.6	08	98.7	43.9	58	144.3	64.3	08	190.0	84.6	58	235.7	104.9
9	08.2	03.7	59	53.9	24.0	09	99.6	44.3	59	145.2	64.7	09	190.9	85.0	59	236.6	105.3
10	09.1	04.1	60	54.8	24.4	10	100.5	44.7	60	146.2	65.1	10	191.8	85.4	60	237.5	105.7
11	10.0	04.5	61	55.7	24.8	111	101.4	45.1	161	147.1	65.5	211	192.7	85.8	261	238.4	106.1
12	11.0	04.9	62	56.6	25.2	12	102.3	45.6	62	148.0	65.9	12	193.7	86.2	62	239.3	106.6
13	11.9	05.3	63	57.6	25.6	13	103.2	46.0	63	148.9	66.3	13	194.6	86.6	63	240.3	107.0
14	12.8	05.7	64	58.5	26.0	14	104.1	46.4	64	149.8	66.7	14	195.5	87.0	64	241.2	107.4
15	13.7	06.1	65	59.4	26.4	15	105.1	46.8	65	150.7	67.1	15	196.4	87.4	65	242.1	107.8
16	14.6	06.5	66	60.3	26.8	116	106.0	47.2	166	151.6	67.5	216	197.3	87.8	266	243.0	108.2
17	15.5	06.9	67	61.2	27.2	17	106.9	47.6	67	152.6	67.9	17	198.2	88.3	67	243.9	108.6
18	16.4	07.3	68	62.1	27.7	18	107.8	48.0	68	153.5	68.3	18	199.1	88.7	68	244.8	109.0
19	17.4	07.7	69	63.0	28.1	19	108.7	48.4	69	154.4	68.7	19	200.1	89.1	69	245.7	109.4
20	18.3	08.1	70	63.9	28.5	20	109.6	48.8	70	155.3	69.1	20	201.0	89.5	70	246.6	109.8
21	19.2	08.5	71	64.9	28.9	121	110.5	49.2	171	156.2	69.5	221	201.9	89.9	271	247.6	110.2
22	20.1	08.9	72	65.8	29.3	22	111.4	49.6	72	157.1	70.0	22	202.8	90.3	72	248.5	110.6
23	21.0	09.4	73	66.7	29.7	23	112.4	50.0	73	158.0	70.4	23	203.7	90.7	73	249.4	111.0
24	21.9	09.8	74	67.6	30.1	24	113.3	50.4	74	158.9	70.8	24	204.6	91.1	74	250.3	111.4
25	22.8	10.2	75	68.5	30.5	25	114.2	50.8	75	159.9	71.2	25	205.5	91.5	75	251.2	111.8
26	23.8	10.6	76	69.4	30.9	126	115.1	51.2	176	160.8	71.6	226	206.5	91.9	276	252.1	112.2
27	24.7	11.0	77	70.3	31.3	27	116.0	51.7	77	161.7	72.0	27	207.4	92.3	77	253.0	112.7
28	25.6	11.4	78	71.3	31.7	28	116.9	52.1	78	162.6	72.4	28	208.3	92.7	78	254.0	113.1
29	26.5	11.8	79	72.2	32.1	29	117.8	52.5	79	163.5	72.8	29	209.2	93.1	79	254.9	113.5
30	27.4	12.2	80	73.1	32.5	30	118.8	52.9	80	164.4	73.2	30	210.1	93.5	80	255.8	113.9
31	28.3	12.6	81	74.0	32.9	131	119.7	53.3	181	165.3	73.6	231	211.0	93.9	281	256.7	114.3
32	29.2	13.0	82	74.9	33.3	32	120.6	53.7	82	166.3	74.0	32	211.9	94.4	82	257.6	114.7
33	30.1	13.4	83	75.8	33.8	33	121.5	54.1	83	167.2	74.4	33	212.8	94.8	83	258.5	115.1
34	31.1	13.8	84	76.7	34.2	34	122.4	54.5	84	168.1	74.8	34	213.8	95.2	84	259.4	115.5
35	32.0	14.2	85	77.6	34.6	35	123.3	54.9	85	169.0	75.2	35	214.7	95.6	85	260.3	115.9
36	32.9	14.6	86	78.6	35.0	136	124.2	55.3	186	169.9	75.6	236	215.6	96.0	286	261.3	116.3
37	33.8	15.0	87	79.5	35.4	37	125.1	55.7	87	170.8	76.1	37	216.5	96.4	87	262.2	116.7
38	34.7	15.5	88	80.4	35.8	38	126.1	56.1	88	171.7	76.5	38	217.4	96.8	88	263.1	117.1
39	35.6	15.9	89	81.3	36.2	39	127.0	56.5	89	172.7	76.9	39	218.3	97.2	89	264.0	117.5
40	36.5	16.3	90	82.2	36.6	40	127.9	56.9	90	173.6	77.3	40	219.2	97.6	90	264.9	117.9
41	37.5	16.7	91	83.1	37.0	141	128.8	57.3	191	174.5	77.7	241	220.2	98.0	291	265.8	118.3
42	38.4	17.1	92	84.0	37.4	42	129.7	57.8	92	175.4	78.1	42	221.1	98.4	92	266.7	118.8
43	39.3	17.5	93	85.0	37.8	43	130.6	58.2	93	176.3	78.5	43	222.0	98.8	93	267.7	119.2
44	40.2	17.9	94	85.9	38.2	44	131.5	58.6	94	177.2	78.9	44	222.9	99.2	94	268.6	119.6
45	41.1	18.3	95	86.8	38.6	45	132.5	59.0	95	178.1	79.3	45	223.8	99.6	95	269.5	120.0
46	42.0	18.7	96	87.7	39.0	146	133.4	59.4	196	179.0	79.7	246	224.7	100.0	296	270.4	120.4
47	42.9	19.1	97	88.6	39.4	47	134.3	59.8	97	180.0	80.1	47	225.6	100.5	97	271.3	120.8
48	43.8	19.5	98	89.5	39.9	48	135.2	60.2	98	180.9	80.5	48	226.5	100.9	98	272.2	121.2
49	44.8	19.9	99	90.4	40.3	49	136.1	60.6	99	181.8	80.9	49	227.5	101.3	99	273.1	121.6
50	45.7	20.3	100	91.4	40.7	150	137.0	61.0	200	182.7	81.3	250	228.4	101.7	300	274.1	122.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

*for 66 Deg.*

# *Difference of Latitude and Departure for 25 Deg.*      25

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.4	51	46.2	21.6	101	91.5	42.7	151	136.9	63.8	201	182.2	84.9	251	227.5	106.1
2	01.8	00.8	52	47.1	22.0	02	92.4	43.1	52	137.8	64.2	02	183.1	85.4	52	228.4	106.5
3	02.7	01.3	53	48.0	22.4	03	93.3	43.5	53	138.7	64.7	03	184.0	85.8	53	229.3	106.9
4	03.6	01.7	54	48.9	22.8	04	94.3	44.0	54	139.6	65.1	04	184.9	86.2	54	230.2	107.3
5	04.5	02.1	55	49.8	23.2	05	95.2	44.4	55	140.5	65.5	05	185.8	86.6	55	231.1	107.8
6	05.4	02.5	56	50.8	23.7	106	96.1	44.8	156	141.4	65.9	206	186.7	87.1	256	232.0	108.2
7	06.3	03.0	57	51.7	24.1	07	97.0	45.2	57	142.3	66.3	07	187.6	87.5	57	232.9	108.6
8	07.3	03.4	58	52.6	24.5	08	97.9	45.6	58	143.2	66.8	08	188.5	87.9	58	233.8	109.0
9	08.2	03.8	59	53.5	24.9	09	98.8	46.1	59	144.1	67.2	09	189.4	88.3	59	234.7	109.5
10	09.1	04.2	60	54.4	25.4	10	99.7	46.5	60	145.0	67.6	10	190.3	88.7	60	235.6	109.9
11	10.0	04.6	61	55.3	25.8	111	100.6	46.9	161	145.9	68.0	211	191.2	89.2	261	236.5	110.3
12	10.9	05.0	62	56.2	26.2	12	101.5	47.3	62	146.8	68.5	12	192.1	89.6	62	237.5	110.7
13	11.8	05.5	63	57.1	26.6	13	102.4	47.8	63	147.7	68.9	13	193.0	90.0	63	238.4	111.1
14	12.7	05.9	64	58.0	27.0	14	103.3	48.2	64	148.6	69.3	14	193.9	90.4	64	239.3	111.6
15	13.6	06.3	65	58.9	27.5	15	104.2	48.6	65	149.5	69.7	15	194.9	90.9	65	240.2	112.0
16	14.5	06.8	66	59.8	27.9	116	105.1	49.0	166	150.4	70.2	216	195.8	91.3	266	241.1	112.4
17	15.4	07.2	67	60.7	28.3	17	106.0	49.4	67	151.4	70.6	17	196.7	91.7	67	242.0	112.8
18	16.3	07.6	68	61.6	28.7	18	106.9	49.9	68	152.3	71.0	18	197.6	92.1	68	242.9	113.3
19	17.2	08.0	69	62.5	29.2	19	107.8	50.3	69	153.2	71.4	19	198.5	92.5	69	243.8	113.7
20	18.1	08.5	70	63.4	29.6	20	108.8	50.7	70	154.1	71.8	20	199.4	93.0	70	244.7	114.1
21	19.0	08.9	71	64.3	30.0	121	109.7	51.1	171	155.0	72.3	221	200.3	93.4	271	245.6	114.5
22	19.9	09.3	72	65.3	30.4	22	110.6	51.6	72	155.9	72.7	22	201.2	93.8	72	246.5	114.9
23	20.8	09.7	73	66.2	30.8	23	111.5	52.0	73	156.8	73.1	23	202.1	94.2	73	247.4	115.4
24	21.8	10.1	74	67.1	31.3	24	112.4	52.4	74	157.7	73.5	24	203.0	94.7	74	248.3	115.8
25	22.7	10.6	75	68.0	31.7	25	113.3	52.8	75	158.6	74.0	25	203.9	95.1	75	249.2	116.2
26	23.6	11.0	76	68.9	32.1	126	114.2	53.2	176	159.5	74.4	226	204.8	95.5	276	250.1	116.6
27	24.5	11.4	77	69.8	32.5	27	115.1	53.7	77	160.4	74.8	27	205.7	95.9	77	251.0	117.1
28	25.4	11.8	78	70.7	33.0	28	116.0	54.1	78	161.3	75.2	28	206.6	96.4	78	252.0	117.5
29	26.3	12.3	79	71.6	33.4	29	116.9	54.5	79	162.2	75.6	29	207.5	96.8	79	252.9	117.9
30	27.2	12.7	80	72.5	33.8	30	117.8	54.9	80	163.1	76.1	30	208.4	97.2	80	253.8	118.3
31	28.1	13.1	81	73.4	34.2	131	118.7	55.4	181	164.0	76.5	231	209.4	97.6	281	254.7	118.8
32	29.0	13.5	82	74.3	34.7	32	119.6	55.8	82	164.9	76.9	32	210.3	98.0	82	255.6	119.2
33	29.9	13.9	83	75.2	35.1	33	120.5	56.2	83	165.9	77.3	33	211.2	98.5	83	256.5	119.6
34	30.8	14.4	84	76.1	35.5	34	121.4	56.6	84	166.8	77.8	34	212.1	98.9	84	257.4	120.0
35	31.7	14.8	85	77.0	35.9	35	122.4	57.1	85	167.7	78.2	35	213.0	99.3	85	258.3	120.4
36	32.6	15.2	86	77.9	36.3	136	123.3	57.5	186	168.6	78.6	236	213.9	99.7	286	259.2	120.9
37	33.5	15.6	87	78.8	36.8	37	124.2	57.9	87	169.5	79.0	37	214.8	100.2	87	260.1	121.3
38	34.4	16.1	88	79.8	37.2	38	125.1	58.3	88	170.4	79.4	38	215.7	100.6	88	261.0	121.7
39	35.3	16.5	89	80.7	37.6	39	126.0	58.7	89	171.3	79.9	39	216.6	101.0	89	261.9	122.1
40	36.3	16.9	90	81.6	38.0	40	126.9	59.2	90	172.2	80.3	40	217.5	101.4	90	262.8	122.6
41	37.2	17.3	91	82.5	38.5	141	127.8	59.6	191	173.1	80.7	241	218.4	101.8	291	263.7	123.0
42	38.1	17.7	92	83.4	38.9	42	128.7	60.0	92	174.0	81.1	42	219.3	102.3	92	264.6	123.4
43	39.0	18.2	93	84.3	39.3	43	129.6	60.4	93	174.9	81.6	43	220.2	102.7	93	265.5	123.8
44	39.9	18.6	94	85.2	39.7	44	130.5	60.9	94	175.8	82.0	44	221.1	103.1	94	266.5	124.2
45	40.8	19.0	95	86.1	40.1	45	131.4	61.3	95	176.7	82.4	45	222.0	103.5	95	267.4	124.7
46	41.7	19.4	96	87.0	40.6	146	132.3	61.7	196	177.6	82.8	246	222.9	104.0	296	268.3	125.1
47	42.6	19.9	97	87.9	41.0	47	133.2	62.1	97	178.5	83.3	47	223.9	104.4	97	269.2	125.5
48	43.5	20.3	98	88.8	41.4	48	134.1	62.5	98	179.4	83.7	48	224.8	104.8	98	270.1	125.9
49	44.4	20.7	99	89.7	41.8	49	135.0	63.0	99	180.4	84.1	49	225.7	105.2	99	271.0	126.4
50	45.3	21.1	100	90.6	42.3	150	135.9	63.4	200	181.3	84.5	250	226.6	105.7	300	271.9	126.8
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

*for 65 Deg.*



26 *Difference of Latitude and Departure for 26 Deg.*

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.4	51	45.8	22.4	101	90.8	44.3	151	135.7	66.2	201	180.7	88.1	251	225.6	110.0
2	01.8	00.9	52	46.7	22.8	02	91.7	44.7	52	136.6	66.6	02	181.6	88.6	52	226.5	110.5
3	02.7	01.3	53	47.6	23.2	03	92.6	45.2	53	137.5	67.1	03	182.5	89.0	53	227.4	110.9
4	03.6	01.8	54	48.5	23.7	04	93.5	45.6	54	138.4	67.5	04	183.4	89.4	54	228.3	111.4
5	04.5	02.2	55	49.4	24.1	05	94.4	46.0	55	139.3	68.0	05	184.3	89.9	55	229.2	111.8
6	05.4	02.6	56	50.3	24.6	106	95.3	46.5	156	140.2	68.4	206	185.2	90.3	256	230.1	112.2
7	06.3	03.1	57	51.2	25.0	07	96.2	46.9	57	141.1	68.8	07	186.1	90.7	57	231.0	112.7
8	07.2	03.5	58	52.1	25.4	08	97.1	47.3	58	142.0	69.3	08	187.0	91.2	58	231.9	113.1
9	08.1	03.9	59	53.0	25.9	09	98.0	47.8	59	142.9	69.7	09	187.8	91.6	59	232.8	113.5
10	09.0	04.4	60	53.9	26.3	10	98.9	48.2	60	143.8	70.1	10	188.7	92.1	60	233.7	114.0
11	09.9	04.8	61	54.8	26.7	111	99.8	48.7	161	144.7	70.6	211	189.6	92.5	261	234.6	114.4
12	10.8	05.3	62	55.7	27.2	12	100.7	49.1	62	145.6	71.0	12	190.5	92.9	62	235.5	114.9
13	11.7	05.7	63	56.6	27.6	13	101.6	49.5	63	146.5	71.5	13	191.4	93.4	63	236.4	115.3
14	12.6	06.1	64	57.5	28.1	14	102.5	50.0	64	147.4	71.9	14	192.3	93.8	64	237.3	115.7
15	13.5	06.6	65	58.4	28.5	15	103.4	50.4	65	148.3	72.3	15	193.2	94.3	65	238.2	116.2
16	14.4	07.0	66	59.3	28.9	116	104.3	50.9	166	149.2	72.8	216	194.1	94.7	266	239.1	116.6
17	15.3	07.5	67	60.2	29.4	17	105.2	51.3	67	150.1	73.2	17	195.0	95.1	67	240.0	117.1
18	16.2	07.9	68	61.1	29.8	18	106.1	51.7	68	151.0	73.7	18	195.9	95.6	68	240.9	117.5
19	17.1	08.3	69	62.0	30.2	19	107.0	52.2	69	151.9	74.1	19	196.8	96.0	69	241.8	117.9
20	18.0	08.7	70	62.9	30.7	20	107.9	52.6	70	152.8	74.5	20	197.7	96.4	70	242.7	118.4
21	18.9	09.2	71	63.8	31.1	121	108.8	53.0	171	153.7	75.0	221	198.6	96.9	271	243.6	118.8
22	19.8	09.6	72	64.7	31.6	22	109.7	53.5	72	154.6	75.4	22	199.5	97.3	72	244.5	119.2
23	20.7	10.1	73	65.6	32.0	23	110.6	53.9	73	155.5	75.8	23	200.4	97.8	73	245.4	119.7
24	21.6	10.5	74	66.5	32.4	24	111.5	54.4	74	156.4	76.3	24	201.3	98.2	74	246.3	120.1
25	22.5	11.0	75	67.4	32.9	25	112.4	54.8	75	157.3	76.7	25	202.2	98.6	75	247.2	120.6
26	23.4	11.4	76	68.3	33.3	126	113.2	55.2	176	158.2	77.2	226	203.1	99.1	276	248.1	121.0
27	24.3	11.8	77	69.2	33.8	27	114.1	55.7	77	159.1	77.6	27	204.0	99.5	77	249.0	121.4
28	25.2	12.3	78	70.1	34.2	28	115.0	56.1	78	160.0	78.0	28	204.9	100.0	78	249.9	121.9
29	26.1	12.7	79	71.0	34.6	29	115.9	56.6	79	160.9	78.5	29	205.8	100.4	79	250.8	122.3
30	27.0	13.2	80	71.9	35.1	30	116.8	57.0	80	161.8	78.9	30	206.7	100.8	80	251.7	122.8
31	27.9	13.6	81	72.8	35.5	131	117.7	57.4	181	162.7	79.4	231	207.6	101.3	281	252.6	123.2
32	28.8	14.0	82	73.7	35.9	32	118.6	57.9	82	163.6	79.8	32	208.5	101.7	82	253.5	123.6
33	29.7	14.5	83	74.6	36.4	33	119.5	58.3	83	164.5	80.2	33	209.4	102.1	83	254.4	124.1
34	30.6	14.9	84	75.5	36.8	34	120.4	58.7	84	165.4	80.7	34	210.3	102.6	84	255.3	124.5
35	31.5	15.3	85	76.4	37.3	35	121.3	59.2	85	166.3	81.1	35	211.2	103.0	85	256.2	124.9
36	32.4	15.8	86	77.3	37.7	136	122.2	59.6	186	167.2	81.5	236	212.1	103.5	286	257.1	125.4
37	33.3	16.2	87	78.2	38.1	37	123.1	60.1	87	168.1	82.0	37	213.0	103.9	87	258.0	125.8
38	34.2	16.7	88	79.1	38.6	38	124.0	60.5	88	169.0	82.4	38	213.9	104.3	88	258.9	126.3
39	35.1	17.1	89	80.0	39.0	39	124.9	60.9	89	169.9	82.9	39	214.8	104.8	89	259.8	126.7
40	36.0	17.5	90	80.9	39.5	40	125.8	61.4	90	170.8	83.3	40	215.7	105.2	90	260.7	127.1
41	36.9	18.0	91	81.8	39.9	141	126.7	61.8	191	171.7	83.7	241	216.6	105.7	291	261.6	127.6
42	37.7	18.4	92	82.7	40.3	42	127.6	62.3	92	172.6	84.2	42	217.5	106.1	92	262.4	128.0
43	38.6	18.9	93	83.6	40.8	43	128.5	62.7	93	173.5	84.6	43	218.4	106.5	93	263.3	128.5
44	39.5	19.3	94	84.5	41.2	44	129.4	63.1	94	174.4	85.0	44	219.3	107.0	94	264.2	128.9
45	40.4	19.7	95	85.4	41.6	45	130.3	63.6	95	175.3	85.5	45	220.2	107.4	95	265.1	129.3
46	41.3	20.2	96	86.3	42.1	146	131.2	64.0	196	176.2	85.9	246	221.1	107.8	296	266.0	129.8
47	42.2	20.6	97	87.2	42.5	47	132.1	64.4	97	177.1	86.4	47	222.0	108.3	97	266.9	130.2
48	43.1	21.0	98	88.1	43.0	48	133.0	64.9	98	178.0	86.8	48	222.9	108.7	98	267.8	130.6
49	44.0	21.5	99	89.0	43.4	49	133.9	65.3	99	178.9	87.2	49	223.8	109.2	99	268.7	131.1
50	44.9	21.9	100	89.9	43.8	150	134.8	65.8	200	179.8	87.7	250	224.7	109.6	300	269.6	131.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

*for 64 Deg.*

# Difference of Latitude and Departure for 27 Deg.

27

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.5	51	45.4	23.2	101	90.0	45.9	151	134.5	68.6	201	179.1	91.3	251	223.6	114.0
2	01.8	00.9	52	46.3	23.6	02	90.9	46.3	52	135.4	69.0	02	180.0	91.7	52	224.5	114.4
3	02.7	01.4	53	47.2	24.1	03	91.8	46.8	53	136.3	69.5	03	180.9	92.2	53	225.4	114.9
4	03.6	01.8	54	48.1	24.5	04	92.7	47.2	54	137.2	69.9	04	181.8	92.6	54	226.3	115.3
5	04.5	02.3	55	49.0	25.0	05	93.6	47.7	55	138.1	70.4	05	182.7	93.1	55	227.2	115.8
6	05.3	02.7	56	49.9	25.4	106	94.4	48.1	156	139.0	70.8	206	183.5	93.5	256	228.1	116.2
7	06.2	03.2	57	50.8	25.9	07	95.3	48.6	57	139.9	71.3	07	184.4	94.0	57	229.0	116.7
8	07.1	03.6	58	51.7	26.3	08	96.2	49.0	58	140.8	71.7	08	185.3	94.4	58	229.9	117.1
9	08.0	04.1	59	52.6	26.8	09	97.1	49.5	59	141.7	72.2	09	186.2	94.9	59	230.8	117.6
10	08.9	04.5	60	53.5	27.2	10	98.0	49.9	60	142.6	72.6	10	187.1	95.3	60	231.7	118.0
11	09.8	05.0	61	54.4	27.7	111	98.9	50.4	161	143.5	73.1	211	188.0	95.8	261	232.6	118.5
12	10.7	05.4	62	55.2	28.1	12	99.8	50.8	62	144.3	73.5	12	188.9	96.2	62	233.4	118.9
13	11.6	05.9	63	56.1	28.6	13	100.7	51.3	63	145.2	74.0	13	189.8	96.7	63	234.3	119.4
14	12.5	06.4	64	57.0	29.1	14	101.6	51.8	64	146.1	74.5	14	190.7	97.2	64	235.2	119.9
15	13.4	06.8	65	57.9	29.5	15	102.5	52.2	65	147.0	74.9	15	191.6	97.6	65	236.1	120.3
16	14.3	07.3	66	58.8	30.0	116	103.4	52.7	166	147.9	75.4	216	192.5	98.1	266	237.0	120.8
17	15.1	07.7	67	59.7	30.4	17	104.2	53.1	67	148.8	75.8	17	193.3	98.5	67	237.9	121.2
18	16.0	08.2	68	60.6	30.9	18	105.1	53.6	68	149.7	76.3	18	194.2	99.0	68	238.8	121.7
19	16.9	08.6	69	61.5	31.3	19	106.0	54.0	69	150.6	76.7	19	195.1	99.4	69	239.7	122.1
20	17.8	09.1	70	62.4	31.8	20	106.9	54.5	70	151.5	77.2	20	196.0	99.9	70	240.6	122.6
21	18.7	09.5	71	63.3	32.2	121	107.8	54.9	171	152.4	77.6	221	196.9	100.3	271	241.5	123.3
22	19.6	10.0	72	64.2	32.7	22	108.7	55.4	72	153.3	78.1	22	197.8	100.8	72	242.4	123.5
23	20.5	10.4	73	65.0	33.1	23	109.6	55.8	73	154.1	78.5	23	198.7	101.2	73	243.2	123.9
24	21.4	10.9	74	65.9	33.6	24	110.5	56.3	74	155.0	79.0	24	199.6	101.7	74	244.1	124.4
25	22.3	11.4	75	66.8	34.1	25	111.4	56.8	75	155.9	79.5	25	200.5	102.2	75	245.0	124.9
26	23.2	11.8	76	67.7	34.5	126	112.3	57.2	176	156.8	79.9	226	201.4	102.6	276	245.9	125.3
27	24.1	12.3	77	68.6	35.0	27	113.2	57.7	77	157.7	80.4	27	202.3	103.1	77	246.8	125.8
28	24.9	12.7	78	69.5	35.4	28	114.0	58.1	78	158.6	80.8	28	203.1	103.5	78	247.7	126.2
29	25.8	13.2	79	70.4	35.9	29	114.9	58.6	79	159.5	81.3	29	204.0	104.0	79	248.6	126.7
30	26.7	13.6	80	71.3	36.3	30	115.8	59.0	80	160.4	81.7	30	204.9	104.4	80	249.5	127.1
31	27.6	14.1	81	72.2	36.8	131	116.7	59.5	181	161.3	82.2	231	205.8	104.9	281	250.4	127.6
32	28.5	14.5	82	73.1	37.2	32	117.6	59.9	82	162.2	82.6	32	206.7	105.3	82	251.3	128.0
33	29.4	15.0	83	74.0	37.7	33	118.5	60.4	83	163.1	83.1	33	207.6	105.8	83	252.2	128.5
34	30.3	15.4	84	74.8	38.2	34	119.4	60.8	84	163.9	83.5	34	208.5	106.2	84	253.0	128.9
35	31.2	15.9	85	75.7	38.6	35	120.3	61.3	85	164.8	84.0	35	209.4	106.7	85	253.9	129.4
36	32.1	16.3	86	76.6	39.0	136	121.2	61.7	186	165.7	84.4	236	210.3	107.1	286	254.8	129.8
37	33.0	16.8	87	77.5	39.5	37	122.1	62.2	87	166.6	84.9	37	211.2	107.6	87	255.7	130.3
38	33.9	17.3	88	78.4	40.0	38	123.0	62.7	88	167.5	85.4	38	212.1	108.1	88	256.6	130.8
39	34.7	17.7	89	79.3	40.4	39	123.8	63.1	89	168.4	85.8	39	212.9	108.5	89	257.5	131.2
40	35.6	18.2	90	80.2	40.9	40	124.7	63.6	90	169.3	86.3	40	213.8	109.0	90	258.4	131.7
41	36.5	18.6	91	81.1	41.3	141	125.6	64.0	191	170.2	86.7	241	214.7	109.4	291	259.3	132.1
42	37.4	19.1	92	82.0	41.8	42	126.5	64.5	92	171.1	87.2	42	215.6	109.9	92	260.2	132.6
43	38.3	19.5	93	82.9	42.2	43	127.4	64.9	93	172.0	87.6	43	216.5	110.3	93	261.1	133.0
44	39.2	20.0	94	83.8	42.7	44	128.3	65.4	94	172.9	88.1	44	217.4	110.8	94	262.0	133.5
45	40.1	20.4	95	84.6	43.1	45	129.2	65.8	95	173.7	88.5	45	218.3	111.2	95	262.8	133.9
46	41.0	20.9	96	85.5	43.6	146	130.1	66.3	196	174.6	89.0	246	219.2	111.7	296	263.7	134.4
47	41.9	21.3	97	86.4	44.0	47	131.0	66.7	97	175.5	89.4	47	220.1	112.1	97	264.6	134.8
48	42.8	21.8	98	87.3	44.5	48	131.9	67.2	98	176.4	89.9	48	221.0	112.6	98	265.5	135.3
49	43.7	22.2	99	88.2	44.9	49	132.8	67.6	99	177.3	90.3	49	221.9	113.0	99	266.4	135.7
50	44.6	22.7	100	89.1	45.4	150	133.7	68.1	200	178.2	90.8	250	222.8	113.5	300	267.3	136.2
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 63 Deg.



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.5	51	45.0	23.9	101	89.2	47.4	151	133.3	70.9	201	177.5	94.4	251	221.6	117.8
2	01.8	00.9	52	45.9	24.4	02	90.1	47.9	52	134.2	71.4	02	178.4	94.8	52	222.5	118.3
3	02.6	01.4	53	46.8	24.9	03	90.9	48.4	53	135.1	71.8	03	179.2	95.3	53	223.4	118.8
4	03.5	01.9	54	47.7	25.4	04	91.8	48.8	54	136.0	72.3	04	180.1	95.8	54	224.3	119.2
5	04.4	02.3	55	48.6	25.8	05	92.7	49.3	55	136.9	72.8	05	181.0	96.2	55	225.2	119.7
6	05.3	02.8	56	49.4	26.3	106	93.6	49.8	156	137.7	73.2	206	181.9	96.7	256	226.0	120.2
7	06.2	03.3	57	50.3	26.8	07	94.5	50.2	57	138.6	73.7	07	182.8	97.2	57	226.9	120.7
8	07.1	03.8	58	51.2	27.2	08	95.4	50.7	58	139.5	74.2	08	183.7	97.7	58	227.8	121.1
9	07.9	04.3	59	52.1	27.7	09	96.2	51.2	59	140.4	74.6	09	184.5	98.1	59	228.7	121.6
10	08.8	04.7	60	53.0	28.2	10	97.1	51.6	60	141.3	75.1	10	185.4	98.6	60	229.6	122.1
11	09.7	05.2	61	53.9	28.6	111	98.0	52.1	161	142.2	75.6	211	186.3	99.1	261	230.5	122.5
12	10.6	05.6	62	54.7	29.1	12	98.9	52.6	62	143.0	76.1	12	187.2	99.5	62	231.3	123.0
13	11.5	06.1	63	55.6	29.6	13	99.8	53.1	63	143.9	76.5	13	188.1	100.0	63	232.2	123.5
14	12.4	06.6	64	56.5	30.0	14	100.7	53.5	64	144.8	77.0	14	189.0	100.5	64	233.1	123.9
15	13.2	07.0	65	57.4	30.5	15	101.5	54.0	65	145.7	77.5	15	189.8	100.9	65	234.0	124.4
16	14.1	07.5	66	58.3	31.0	116	102.4	54.5	166	146.6	77.9	216	190.7	101.4	266	234.9	124.9
17	15.0	08.0	67	59.2	31.5	17	103.3	54.9	67	147.5	78.4	17	191.6	101.9	67	235.8	125.4
18	15.9	08.5	68	60.0	31.9	18	104.2	55.4	68	148.3	78.9	18	192.5	102.4	68	236.6	125.8
19	16.8	08.9	69	60.9	32.4	19	105.1	55.9	69	149.2	79.3	19	193.4	102.8	69	237.5	126.3
20	17.7	09.4	70	61.8	32.9	20	106.0	56.3	70	150.1	79.8	20	194.3	103.3	70	238.4	126.8
21	18.5	09.9	71	62.7	33.3	121	106.8	56.8	171	151.0	80.3	221	195.1	103.8	271	239.3	127.2
22	19.4	10.3	72	63.6	33.8	22	107.7	57.3	72	151.9	80.8	22	196.0	104.2	72	240.2	127.7
23	20.3	10.8	73	64.5	34.3	23	108.6	57.7	73	152.8	81.2	23	196.9	104.7	73	241.1	128.2
24	21.2	11.3	74	65.3	34.7	24	109.5	58.2	74	153.6	81.7	24	197.8	105.2	74	241.9	128.6
25	22.1	11.7	75	66.2	35.2	25	110.4	58.7	75	154.5	82.2	25	198.7	105.6	75	242.8	129.1
26	23.0	12.2	76	67.1	35.7	126	111.3	59.2	176	155.4	82.6	226	199.6	106.1	276	243.7	129.6
27	23.8	12.7	77	68.0	36.2	27	112.1	59.6	77	156.3	83.1	27	200.4	106.6	77	244.6	130.1
28	24.7	13.1	78	68.9	36.6	28	113.0	60.1	78	157.2	83.6	28	201.3	107.0	78	245.5	130.5
29	25.6	13.6	79	69.8	37.1	29	113.9	60.6	79	158.1	84.0	29	202.2	107.5	79	246.4	131.0
30	26.5	14.1	80	70.6	37.6	30	114.8	61.0	80	158.9	84.5	30	203.1	108.0	80	247.2	131.5
31	27.4	14.6	81	71.5	38.0	131	115.7	61.5	181	159.8	85.0	231	204.0	108.5	281	248.1	131.9
32	28.3	15.0	82	72.4	38.5	32	116.6	62.0	82	160.7	85.4	32	204.9	108.9	82	249.0	132.4
33	29.1	15.5	83	73.3	39.0	33	117.4	62.4	83	161.6	85.9	33	205.7	109.4	83	249.9	132.9
34	30.0	16.0	84	74.2	39.4	34	118.3	62.9	84	162.5	86.4	34	206.6	109.9	84	250.8	133.3
35	30.9	16.4	85	75.1	39.9	35	119.2	63.4	85	163.4	86.9	35	207.5	110.3	85	251.7	133.8
36	31.8	16.9	86	75.9	40.4	136	120.1	63.9	186	164.2	87.3	236	208.4	110.8	286	252.5	134.3
37	32.7	17.4	87	76.8	40.8	37	121.0	64.3	87	165.1	87.8	37	209.3	111.3	87	253.4	134.7
38	33.6	17.8	88	77.7	41.3	38	121.9	64.8	88	166.0	88.3	38	210.2	111.7	88	254.3	135.2
39	34.4	18.3	89	78.6	41.8	39	122.7	65.3	89	166.9	88.7	39	211.0	112.2	89	255.2	135.7
40	35.3	18.8	90	79.5	42.3	40	123.6	65.7	90	167.8	89.2	40	211.9	112.7	90	256.1	136.2
41	36.2	19.2	91	80.4	42.7	141	124.5	66.2	191	168.7	89.7	241	212.8	113.1	291	257.0	136.6
42	37.1	19.7	92	81.2	43.2	42	125.4	66.7	92	169.5	90.1	42	213.7	113.6	92	257.8	137.1
43	38.0	20.2	93	82.1	43.7	43	126.3	67.1	93	170.4	90.6	43	214.6	114.1	93	258.7	137.6
44	38.9	20.7	94	83.0	44.1	44	127.2	67.6	94	171.3	91.1	44	215.5	114.6	94	259.6	138.0
45	39.7	21.1	95	83.9	44.6	45	128.0	68.1	95	172.2	91.6	45	216.3	115.0	95	260.5	138.5
46	40.6	21.6	96	84.8	45.1	146	128.9	68.5	196	173.1	92.0	246	217.2	115.5	296	261.4	139.0
47	41.5	22.1	97	85.7	45.5	47	129.8	69.0	97	174.0	92.5	47	218.1	115.9	97	262.3	139.4
48	42.4	22.5	98	86.5	46.0	48	130.7	69.5	98	174.8	93.0	48	219.0	116.4	98	263.1	139.9
49	43.3	23.0	99	87.4	46.5	49	131.6	70.0	99	175.7	93.4	49	219.9	116.9	99	264.0	140.4
50	44.2	23.5	100	88.3	47.0	150	132.5	70.4	200	176.6	93.9	250	220.8	117.4	300	264.9	140.9
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 62 Deg.

# Difference of Latitude and Departure for 29 Deg.

29

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.5	51	44.6	24.7	101	88.3	49.0	151	132.1	73.2	201	175.8	97.4	251	219.5	121.7
2	01.7	01.0	52	45.5	25.2	02	89.2	49.4	52	132.9	73.7	02	176.7	97.9	52	220.4	122.2
3	02.6	01.5	53	46.4	25.7	03	90.1	49.9	53	133.8	74.2	03	177.5	98.4	53	221.3	122.7
4	03.5	01.9	54	47.2	26.2	04	91.0	50.4	54	134.7	74.7	04	178.4	98.9	54	222.2	123.1
5	04.4	02.4	55	48.1	26.7	05	91.8	50.9	55	135.6	75.1	05	179.3	99.4	55	223.0	123.6
6	05.2	02.9	56	49.0	27.1	106	92.7	51.4	156	136.4	75.6	206	180.2	99.9	256	223.9	124.1
7	06.1	03.4	57	49.9	27.6	07	93.6	51.9	57	137.3	76.1	07	181.0	100.4	57	224.8	124.6
8	07.0	03.9	58	50.7	28.1	08	94.5	52.4	58	138.2	76.6	08	181.9	100.8	58	225.6	125.1
9	07.9	04.4	59	51.6	28.6	09	95.3	52.8	59	139.1	77.1	09	182.8	101.3	59	226.5	125.6
10	08.7	04.8	60	52.5	29.1	10	96.2	53.3	60	139.9	77.6	10	183.7	101.8	60	227.4	126.0
11	09.6	05.3	61	53.4	29.6	111	97.1	53.8	161	140.8	78.1	211	184.5	102.3	261	228.3	126.5
12	10.5	05.8	62	54.2	30.1	12	98.0	54.3	62	141.7	78.5	12	185.4	102.8	62	229.1	127.0
13	11.4	06.3	63	55.1	30.5	13	98.8	54.8	63	142.6	79.0	13	186.3	103.3	63	230.0	127.5
14	12.2	06.8	64	56.0	31.0	14	99.7	55.3	64	143.4	79.5	14	187.2	103.7	64	230.9	128.0
15	13.1	07.3	65	56.8	31.5	15	100.6	55.8	65	144.3	80.0	15	188.0	104.2	65	231.8	128.5
16	14.0	07.8	66	57.7	32.0	116	101.5	56.2	166	145.2	80.5	216	188.9	104.7	266	232.6	129.0
17	14.9	08.2	67	58.6	32.5	17	102.3	56.7	67	146.1	81.0	17	189.8	105.2	67	233.5	129.4
18	15.7	08.7	68	59.5	33.0	18	103.2	57.2	68	146.9	81.4	18	190.7	105.7	68	234.4	129.9
19	16.6	09.2	69	60.3	33.5	19	104.1	57.7	69	147.8	81.9	19	191.5	106.2	69	235.3	130.4
20	17.5	09.7	70	61.2	33.9	20	105.0	58.2	70	148.7	82.4	20	192.4	106.7	70	236.1	130.9
21	18.4	10.2	71	62.1	34.4	121	105.8	58.7	171	149.6	82.9	221	193.3	107.1	271	237.0	131.4
22	19.2	10.7	72	63.0	34.9	22	106.7	59.1	72	150.4	83.4	22	194.2	107.6	72	237.9	131.9
23	20.1	11.2	73	63.8	35.4	23	107.6	59.6	73	151.3	83.9	23	195.0	108.1	73	238.8	132.4
24	21.0	11.6	74	64.7	35.9	24	108.5	60.1	74	152.2	84.4	24	195.9	108.6	74	239.6	132.8
25	21.9	12.1	75	65.6	36.4	25	109.3	60.6	75	153.1	84.8	25	196.8	109.1	75	240.5	133.3
26	22.7	12.6	76	66.5	36.8	126	110.2	61.1	176	153.9	85.3	226	197.7	109.6	276	241.4	133.8
27	23.6	13.1	77	67.3	37.3	27	111.1	61.6	77	154.8	85.8	27	198.5	110.0	77	242.3	134.3
28	24.5	13.6	78	68.2	37.8	28	111.9	62.1	78	155.7	86.3	28	199.4	110.5	78	243.1	134.8
29	25.4	14.1	79	69.1	38.3	29	112.8	62.5	79	156.6	86.8	29	200.3	111.0	79	244.0	135.3
30	26.2	14.5	80	70.0	38.8	30	113.7	63.0	80	157.4	87.3	30	201.2	111.5	80	244.9	135.7
31	27.1	15.0	81	70.8	39.3	131	114.6	63.5	181	158.3	87.7	231	202.0	112.0	281	245.8	136.2
32	28.0	15.5	82	71.7	39.8	32	115.4	64.0	82	159.2	88.2	32	202.9	112.5	82	246.6	136.7
33	28.9	16.0	83	72.6	40.2	33	116.3	64.5	83	160.1	88.7	33	203.8	113.0	83	247.5	137.2
34	29.7	16.5	84	73.5	40.7	34	117.2	65.0	84	160.9	89.2	34	204.7	113.4	84	248.4	137.7
35	30.6	17.0	85	74.3	41.2	35	118.1	65.4	85	161.8	89.7	35	205.5	113.9	85	249.3	138.2
36	31.5	17.5	86	75.2	41.7	136	118.9	65.9	186	162.7	90.2	236	206.4	114.4	286	250.1	138.7
37	32.4	17.9	87	76.1	42.2	37	119.8	66.4	87	163.6	90.7	37	207.3	114.9	87	251.0	139.1
38	33.2	18.4	88	77.0	42.7	38	120.7	66.9	88	164.4	91.1	38	208.2	115.4	88	251.9	139.6
39	34.1	18.9	89	77.8	43.1	39	121.6	67.4	89	165.3	91.6	39	209.0	115.9	89	252.8	140.1
40	35.0	19.4	90	78.7	43.6	40	122.4	67.9	90	166.2	92.1	40	209.9	116.4	90	253.6	140.6
41	35.9	19.9	91	79.6	44.1	141	123.3	68.4	191	167.0	92.6	241	210.8	116.8	291	254.5	141.1
42	36.7	20.4	92	80.5	44.6	42	124.2	68.8	92	167.9	93.1	42	211.7	117.3	92	255.4	141.6
43	37.6	20.8	93	81.3	45.1	43	125.1	69.3	93	168.8	93.6	43	212.5	117.8	93	256.3	142.0
44	38.5	21.3	94	82.2	45.6	44	125.9	69.8	94	169.7	94.1	44	213.4	118.3	94	257.1	142.5
45	39.4	21.8	95	83.1	46.1	45	126.8	70.3	95	170.5	94.5	45	214.3	118.8	95	258.0	143.0
46	40.2	22.3	96	84.0	46.5	146	127.7	70.8	196	171.4	95.0	246	215.2	119.3	296	258.9	143.5
47	41.1	22.8	97	84.8	47.0	47	128.6	71.3	97	172.3	95.5	47	216.0	119.7	97	259.8	144.0
48	42.0	23.3	98	85.7	47.5	48	129.4	71.8	98	173.2	96.0	48	216.9	120.2	98	260.6	144.5
49	42.9	23.8	99	86.6	48.0	49	130.3	72.2	99	174.0	96.5	49	217.8	120.7	99	261.5	145.0
50	43.7	24.2	100	87.5	48.5	150	131.2	72.7	200	174.9	97.0	250	218.7	121.2	300	262.4	145.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 61 Deg.



Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.9	00.5	51	44.2	25.5	101	87.5	50.5	151	130.8	75.5	201	174.1	100.5	251	217.4	125.5
2	01.7	01.0	52	45.0	26.0	02	88.3	51.0	52	131.6	76.0	02	174.9	101.0	52	218.2	126.0
3	02.6	01.5	53	45.9	26.5	03	89.2	51.5	53	132.5	76.5	03	175.8	101.5	53	219.1	126.5
4	03.5	02.0	54	46.8	27.0	04	90.1	52.0	54	133.4	77.0	04	176.7	102.0	54	220.0	127.0
5	04.3	02.5	55	47.6	27.5	05	90.9	52.5	55	134.2	77.5	05	177.5	102.5	55	220.8	127.5
6	05.2	03.0	56	48.5	28.0	106	91.8	53.0	156	135.1	78.0	206	178.4	103.0	256	221.7	128.0
7	06.1	03.5	57	49.4	28.5	07	92.7	53.5	57	136.0	78.5	07	179.3	103.5	57	222.6	128.5
8	06.9	04.0	58	50.2	29.0	08	93.5	54.0	58	136.8	79.0	08	180.1	104.0	58	223.4	129.0
9	07.8	04.5	59	51.1	29.5	09	94.4	54.5	59	137.7	79.5	09	181.0	104.5	59	224.3	129.5
10	08.7	05.0	60	52.0	30.0	10	95.3	55.0	60	138.6	80.0	10	181.9	105.0	60	225.2	130.0
11	09.5	05.5	61	52.8	30.5	111	96.1	55.5	161	139.4	80.5	211	182.7	105.5	261	226.0	130.5
12	10.4	06.0	62	53.7	31.0	12	97.0	56.0	62	140.3	81.0	12	183.6	106.0	62	226.9	131.0
13	11.3	06.5	63	54.6	31.5	13	97.9	56.5	63	141.2	81.5	13	184.5	106.5	63	227.8	131.5
14	12.1	07.0	64	55.4	32.0	14	98.7	57.0	64	142.0	82.0	14	185.3	107.0	64	228.6	132.0
15	13.0	07.5	65	56.3	32.5	15	99.6	57.5	65	142.9	82.5	15	186.2	107.5	65	229.5	132.5
16	13.9	08.0	66	57.2	33.0	116	100.5	58.0	166	143.8	83.0	216	117.1	108.0	266	230.4	133.0
17	14.7	08.5	67	58.0	33.5	17	101.3	58.5	67	144.6	83.5	17	187.9	108.5	67	231.2	133.5
18	15.6	09.0	68	58.9	34.0	18	102.2	59.0	68	145.5	84.0	18	188.8	109.0	68	232.1	134.0
19	16.5	09.5	69	59.8	34.5	19	103.1	59.5	69	146.4	84.5	19	189.7	109.5	69	233.0	134.5
20	17.3	10.0	70	60.6	35.0	20	103.9	60.0	70	147.2	85.0	20	190.5	110.0	70	233.8	135.0
21	18.2	10.5	71	61.5	35.5	121	104.8	60.5	171	148.1	85.5	221	191.4	110.5	271	234.7	135.5
22	19.1	11.0	72	62.4	36.0	22	105.7	61.0	72	149.0	86.0	22	192.3	111.0	72	235.6	136.0
23	19.9	11.5	73	63.2	36.5	23	106.5	61.5	73	149.8	86.5	23	193.1	111.5	73	236.4	136.5
24	20.8	12.0	74	64.1	37.0	24	107.4	62.0	74	150.7	87.0	24	194.0	112.0	74	237.3	137.0
25	21.7	12.5	75	65.0	37.5	25	108.3	62.5	75	151.6	87.5	25	194.9	112.5	75	238.2	137.5
26	22.5	13.0	76	65.8	38.0	126	109.1	63.0	176	152.4	88.0	226	195.7	113.0	276	239.0	138.0
27	23.4	13.5	77	66.7	38.5	27	110.0	63.5	77	153.3	88.5	27	196.6	113.5	77	239.9	138.5
28	24.2	14.0	78	67.5	39.0	28	110.8	64.0	78	154.1	89.0	28	197.4	114.0	78	240.7	139.0
29	25.1	14.5	79	68.4	39.5	29	111.7	64.5	79	155.0	89.5	29	198.3	114.5	79	241.6	139.5
30	26.0	15.0	80	69.3	40.0	30	112.6	65.0	80	155.9	90.0	30	199.2	115.0	80	242.5	140.0
31	26.8	15.5	81	70.1	40.5	131	113.4	65.5	181	156.7	90.5	231	200.0	115.5	281	243.3	140.5
32	27.7	16.0	82	71.0	41.0	32	114.3	66.0	82	157.6	91.0	32	200.9	116.0	82	244.2	141.0
33	28.6	16.5	83	71.9	41.5	33	115.2	66.5	83	158.5	91.5	33	201.8	116.5	83	245.1	141.5
34	29.4	17.0	84	72.7	42.0	34	116.0	67.0	84	159.3	92.0	34	202.6	117.0	84	245.9	142.0
35	30.3	17.5	85	73.6	42.5	35	116.9	67.5	85	160.2	92.5	35	203.5	117.5	85	246.8	142.5
36	31.2	18.0	86	74.5	43.0	136	117.8	68.0	186	161.1	93.0	236	204.4	118.0	286	247.7	143.0
37	32.0	18.5	87	75.3	43.5	37	118.6	68.5	87	161.9	93.5	37	205.2	118.5	87	248.5	143.5
38	32.9	19.0	88	76.2	44.0	38	119.5	69.0	88	162.8	94.0	38	206.1	119.0	88	249.4	144.0
39	33.8	19.5	89	77.1	44.5	39	120.4	69.5	89	163.7	94.5	39	207.0	119.5	89	250.3	144.5
40	34.6	20.0	90	77.9	45.0	40	121.2	70.0	90	164.5	95.0	40	207.8	120.0	90	251.1	145.0
41	35.5	20.5	91	78.8	45.5	141	122.1	70.5	191	165.4	95.5	241	208.7	120.5	291	252.0	145.5
42	36.4	21.0	92	79.7	46.0	42	123.0	71.0	92	166.3	96.0	42	209.6	121.0	92	252.9	146.0
43	37.2	21.5	93	80.5	46.5	43	123.8	71.5	93	167.1	96.5	43	210.4	121.5	93	253.7	146.5
44	38.1	22.0	94	81.4	47.0	44	124.7	72.0	94	168.0	97.0	44	211.3	122.0	94	254.6	147.0
45	39.0	22.5	95	82.3	47.5	45	125.6	72.5	95	168.9	97.5	45	212.2	122.5	95	255.5	147.5
46	39.8	23.0	96	83.1	48.0	146	126.4	73.0	196	169.7	98.0	246	213.0	123.0	296	256.3	148.0
47	40.7	23.5	97	84.0	48.5	47	127.3	73.5	97	170.6	98.5	47	213.9	123.5	97	257.2	148.5
48	41.6	24.0	98	84.9	49.0	48	128.2	74.0	98	171.5	99.0	48	214.8	124.0	98	258.1	149.0
49	42.4	24.5	99	85.7	49.5	49	129.0	74.5	99	172.3	99.5	49	215.6	124.5	99	258.9	149.5
50	43.3	25.0	100	86.6	50.0	150	129.9	75.0	200	173.2	100.0	250	216.5	125.0	300	259.8	150.0
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

for 60 Deg.

# Difference of Latitude and Departure for 31 Deg.

31

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.9	00.5	51	43.7	26.3	101	86.6	52.0	151	129.4	77.8	201	172.3	103.5	251	215.1	129.3
2	01.7	01.0	52	44.6	26.8	02	87.4	52.5	52	130.3	78.3	02	173.1	104.0	52	216.0	129.8
3	02.6	01.5	53	45.4	27.3	03	88.3	53.0	53	131.1	78.8	03	174.0	104.5	53	216.8	130.3
4	03.5	02.1	54	46.3	27.8	04	89.1	53.6	54	132.0	79.3	04	174.8	105.1	54	217.7	130.8
5	04.3	02.6	55	47.1	28.3	05	90.0	54.1	55	132.8	79.8	05	175.7	105.6	55	218.5	131.3
6	05.1	03.1	56	48.0	28.8	106	90.8	54.6	156	133.7	80.3	206	176.5	106.1	256	219.4	131.8
7	06.0	03.6	57	48.8	29.4	07	91.7	55.1	57	134.5	80.9	07	177.4	106.6	57	220.2	132.4
8	06.9	04.1	58	49.7	29.9	08	92.6	55.6	58	135.4	81.4	08	178.3	107.1	58	221.1	132.9
9	07.7	04.6	59	50.6	30.4	09	93.4	56.1	59	136.3	81.9	09	179.1	107.6	59	222.0	133.4
10	08.6	05.2	60	51.4	30.9	10	94.3	56.7	60	137.1	82.4	10	180.0	108.2	60	222.8	133.9
11	09.4	05.7	61	52.3	31.4	111	95.1	57.2	161	138.0	82.9	211	180.8	108.7	261	223.7	134.4
12	10.3	06.2	62	53.1	31.9	12	96.0	57.7	62	138.8	83.4	12	181.7	109.2	62	224.5	134.9
13	11.1	06.7	63	54.0	32.4	13	96.8	58.2	63	139.7	83.9	13	182.5	109.7	63	225.4	135.4
14	12.0	07.2	64	54.8	33.0	14	97.7	58.7	64	140.5	84.5	14	183.4	110.2	64	226.2	136.0
15	12.9	07.7	65	55.7	33.5	15	98.6	59.2	65	141.4	85.0	15	184.3	110.7	65	227.1	136.5
16	13.7	08.2	66	56.6	34.0	116	99.4	59.7	166	142.3	85.5	216	185.1	121.2	266	228.0	137.0
17	14.6	08.8	67	57.4	34.5	17	100.3	60.3	67	143.1	86.0	17	186.0	111.8	67	228.8	137.5
18	15.4	09.3	68	58.3	35.0	18	101.1	60.8	68	144.0	86.5	18	186.8	112.3	68	229.7	138.0
19	16.3	09.8	69	59.1	35.5	19	102.0	61.3	69	144.8	87.0	19	187.7	112.8	69	230.5	138.5
20	17.1	10.3	70	60.0	36.1	20	102.8	61.8	70	145.7	87.6	20	188.5	113.3	70	231.4	139.1
21	18.0	10.8	71	60.8	36.6	121	103.7	62.3	171	146.5	88.1	221	189.4	113.8	271	232.2	139.6
22	18.9	11.3	72	61.7	37.1	22	104.6	62.8	72	147.4	88.6	22	190.3	114.3	72	233.1	140.1
23	19.7	11.8	73	62.6	37.6	23	105.4	63.3	73	148.3	89.1	23	191.1	114.8	73	234.0	140.6
24	20.6	12.4	74	63.4	38.1	24	106.3	63.9	74	149.1	89.6	24	192.0	115.4	74	234.8	141.1
25	21.4	12.9	75	64.3	38.6	25	107.1	64.4	75	150.0	90.1	25	192.8	115.9	75	235.7	141.6
26	22.3	13.4	76	65.1	39.1	126	108.0	64.9	176	150.8	90.6	226	193.7	116.4	276	236.5	142.1
27	23.1	13.9	77	66.0	39.7	27	108.8	65.4	77	151.7	91.2	27	194.5	116.9	77	237.4	142.7
28	24.0	14.4	78	66.8	40.2	28	109.7	65.9	78	152.5	91.7	28	195.4	117.4	78	238.2	143.2
29	24.9	14.9	79	67.7	40.7	29	110.6	66.4	79	153.4	92.2	29	196.3	117.9	79	239.0	143.7
30	25.7	15.5	80	68.6	41.2	30	111.4	67.0	80	154.3	92.7	30	197.1	118.5	80	240.0	144.2
31	26.6	16.0	81	69.4	41.7	131	112.3	67.5	181	155.1	93.2	231	198.0	119.0	281	240.8	144.7
32	27.4	16.5	82	70.3	42.2	32	113.1	68.0	82	156.0	93.7	32	198.8	119.5	82	241.7	145.2
33	28.3	17.0	83	71.1	42.7	33	114.0	68.5	83	156.8	94.2	33	199.7	120.0	83	242.5	145.7
34	29.1	17.5	84	72.0	43.3	34	114.8	69.0	84	157.7	94.8	34	200.5	120.5	84	243.4	146.3
35	30.0	18.0	85	72.8	43.8	35	115.7	69.5	85	158.5	95.3	35	201.4	121.0	85	244.2	146.8
36	30.9	18.5	86	73.7	44.3	136	116.6	70.0	186	159.4	95.8	236	202.3	121.5	286	245.1	147.3
37	31.7	19.1	87	74.6	44.8	37	117.4	70.6	87	160.3	96.3	37	203.1	122.1	87	246.0	147.8
38	32.6	19.6	88	75.4	45.3	38	118.3	71.1	88	161.1	96.8	38	204.0	122.6	88	246.8	148.3
39	33.4	20.1	89	76.3	45.8	39	119.1	71.6	89	162.0	97.3	39	204.8	123.1	89	247.7	148.8
40	34.3	20.6	90	77.1	46.4	40	120.0	72.1	90	162.8	97.9	40	205.7	123.6	90	248.5	149.4
41	35.1	21.1	91	78.0	46.9	141	120.8	72.6	191	163.7	98.4	241	206.5	124.1	291	249.4	149.9
42	36.0	21.6	92	78.8	47.4	42	121.7	73.1	92	164.5	98.9	42	207.4	124.6	92	250.2	150.4
43	36.9	22.1	93	79.7	47.9	43	122.6	73.6	93	165.4	99.4	43	208.3	125.1	93	251.1	150.9
44	37.7	22.6	94	80.6	48.4	44	123.4	74.2	94	166.3	99.9	44	209.1	125.6	94	252.0	151.4
45	38.6	23.2	95	81.4	48.9	45	124.3	74.7	95	167.1	100.4	45	210.0	126.2	95	252.8	151.9
46	39.4	23.7	96	82.3	49.4	146	125.1	75.2	196	168.0	100.9	246	210.8	126.7	296	253.7	152.4
47	40.3	24.2	97	83.1	50.0	47	126.0	75.7	97	168.8	101.5	47	211.7	127.2	97	254.5	153.0
48	41.1	24.7	98	84.0	50.5	48	126.8	76.2	98	169.7	102.0	48	212.5	127.7	98	255.4	153.5
49	42.0	25.2	99	84.8	51.0	49	127.7	76.7	99	170.5	102.5	49	213.4	128.2	99	256.2	154.0
50	42.9	25.8	100	85.7	51.5	150	128.6	77.3	200	171.4	103.0	250	214.3	128.8	300	257.1	154.5
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

for 59 Deg.



Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.8	00.5	51	43.2	27.0	101	85.6	53.5	151	128.0	80.0	201	170.4	106.5	251	212.8	133.0
2	01.7	01.1	52	44.1	27.6	02	86.5	54.1	52	128.9	80.6	02	171.5	107.1	52	213.7	133.6
3	02.5	01.6	53	44.9	28.1	03	87.3	54.6	53	129.7	81.1	03	172.1	107.6	53	214.5	134.1
4	03.4	02.1	54	45.8	28.6	04	88.2	55.1	54	130.6	81.6	04	173.0	108.1	54	215.4	134.6
5	04.2	02.7	55	46.6	29.2	05	89.0	55.7	55	131.4	82.2	05	173.8	108.7	55	216.2	135.2
6	05.1	03.2	56	47.5	29.7	106	89.9	56.2	156	132.3	82.7	206	174.7	109.2	256	217.1	135.7
7	05.9	03.7	57	48.3	30.2	07	90.7	56.7	57	133.1	83.2	07	175.5	109.7	57	217.9	136.2
8	06.8	04.2	58	49.2	30.7	08	91.6	57.2	58	134.0	83.7	08	176.4	110.2	58	218.8	136.7
9	07.6	04.8	59	50.0	31.3	09	92.4	57.8	59	134.8	84.3	09	177.2	110.8	59	219.6	137.3
10	08.5	05.3	60	50.9	31.8	10	93.3	58.3	60	135.7	84.8	10	178.1	111.3	60	220.5	137.8
11	09.3	05.8	61	51.7	32.3	111	94.1	58.8	161	136.5	85.3	211	178.9	111.8	261	221.3	138.3
12	10.2	06.4	62	52.6	32.9	12	95.0	59.4	62	137.4	85.9	12	179.8	112.4	62	222.2	138.9
13	11.0	06.9	63	53.4	33.4	13	95.8	59.9	63	138.2	86.4	13	180.6	112.9	63	223.0	139.4
14	11.9	07.4	64	54.3	33.9	14	96.7	60.4	64	139.1	86.9	14	181.5	113.4	64	223.9	139.9
15	12.7	08.0	65	55.1	34.5	15	97.5	61.0	65	139.9	87.5	15	182.3	114.0	65	224.7	140.5
16	13.6	08.5	66	56.0	35.0	116	98.4	61.5	166	140.8	88.0	216	183.2	114.5	266	225.6	141.0
17	14.4	09.0	67	56.8	35.5	17	99.2	62.0	67	141.6	88.5	17	184.0	115.0	67	226.4	141.5
18	15.3	09.5	68	57.7	36.0	18	100.1	62.5	68	142.5	89.0	18	184.9	115.5	68	227.3	142.0
19	16.1	10.1	69	58.5	36.6	19	100.9	63.1	69	143.3	89.6	19	185.7	116.1	69	228.1	142.6
20	17.0	10.6	70	59.4	37.1	20	101.8	63.6	70	144.2	90.1	20	186.6	116.6	70	229.0	143.1
21	17.8	11.1	71	60.2	37.6	121	102.6	64.1	171	145.0	90.6	221	187.4	117.1	271	229.8	143.6
22	18.7	11.7	72	61.1	38.2	22	103.5	64.7	72	145.9	91.2	22	188.3	117.7	72	230.7	144.2
23	19.5	12.2	73	61.9	38.7	23	104.3	65.2	73	146.7	91.7	23	189.1	118.2	73	231.5	144.7
24	20.4	12.7	74	62.8	39.2	24	105.2	65.7	74	147.6	92.2	24	190.0	118.7	74	232.4	145.2
25	21.2	13.3	75	63.6	39.8	25	106.0	66.3	75	148.4	92.8	25	190.8	119.3	75	233.2	145.8
26	22.0	13.8	76	64.4	40.3	126	106.8	66.8	176	149.2	93.3	226	191.6	119.8	276	234.0	146.3
27	22.9	14.3	77	65.3	40.8	27	107.7	67.3	77	150.1	93.8	27	192.5	120.3	77	234.9	146.8
28	23.7	14.8	78	66.1	41.3	28	108.5	67.8	78	150.9	94.3	28	193.3	120.8	78	235.7	147.3
29	24.6	15.4	79	67.0	41.9	29	109.4	68.4	79	151.8	94.9	29	194.2	121.4	79	236.6	147.9
30	25.4	15.9	80	67.8	42.4	30	110.2	68.9	80	152.6	95.4	30	195.0	121.9	80	237.4	148.4
31	26.3	16.4	81	68.7	42.9	131	111.1	69.4	181	153.5	95.9	231	195.9	122.4	281	238.3	148.9
32	27.1	17.0	82	69.5	43.5	32	111.9	70.0	82	154.3	96.5	32	196.7	123.0	82	239.1	149.5
33	28.0	17.5	83	70.4	44.0	33	112.8	70.5	83	155.2	97.0	33	197.6	123.5	83	240.0	150.0
34	28.8	18.0	84	71.2	44.5	34	113.6	71.0	84	156.0	97.5	34	198.4	124.0	84	240.8	150.5
35	29.7	18.6	85	72.1	45.1	35	114.5	71.6	85	156.9	98.1	35	199.3	124.6	85	241.7	151.1
36	30.5	19.1	86	72.9	45.6	136	115.3	72.1	186	157.7	98.6	236	200.1	125.1	286	242.5	151.6
37	31.4	19.6	87	73.8	46.1	37	116.2	72.6	87	158.6	99.1	37	201.0	125.6	87	243.4	152.1
38	32.2	20.1	88	74.6	46.6	38	117.0	73.1	88	159.4	99.6	38	201.8	126.1	88	244.2	152.6
39	33.1	20.7	89	75.5	47.2	39	117.9	73.7	89	160.3	100.2	39	202.7	126.7	89	245.1	153.2
40	33.9	21.2	90	76.3	47.7	40	118.7	74.2	90	161.1	100.7	40	203.5	127.2	90	245.9	153.7
41	34.8	21.7	91	77.2	48.2	141	119.6	74.7	191	162.0	101.2	241	204.4	127.7	291	246.8	154.2
42	35.6	22.3	92	78.0	48.8	42	120.4	75.3	92	162.8	101.8	42	205.2	128.3	92	247.6	154.8
43	36.5	22.8	93	78.9	49.3	43	121.3	75.8	93	163.7	102.3	43	206.1	128.8	93	248.5	155.3
44	37.3	23.3	94	79.7	49.8	44	122.1	76.3	94	164.5	102.8	44	206.9	129.3	94	249.3	155.8
45	38.2	23.9	95	80.6	50.4	45	123.0	76.9	95	165.4	103.4	45	207.8	129.9	95	250.2	156.4
46	39.0	24.4	96	81.4	50.9	146	123.8	77.4	196	166.2	103.9	246	208.6	130.4	296	251.0	156.9
47	39.9	24.9	97	82.3	51.4	47	124.7	77.9	97	167.1	104.4	47	209.5	130.9	97	251.9	157.4
48	40.7	25.4	98	83.1	51.9	48	125.5	78.4	98	167.9	104.9	48	210.3	131.4	98	252.7	157.9
49	41.6	26.0	99	84.0	52.5	49	126.4	79.0	99	168.8	105.5	49	211.2	132.0	99	253.6	158.5
50	42.4	26.5	100	84.8	53.0	150	127.2	79.5	200	169.6	106.0	250	212.0	132.5	300	254.4	159.0
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

for 58 Deg.

# Difference of Latitude and Departure for 33 Deg. 33

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.8	00.5	51	42.8	27.8	101	84.7	55.0	151	126.6	82.2	201	168.6	109.5	251	210.5	136.7
2	01.7	01.1	52	43.6	28.3	02	85.5	55.5	52	127.5	82.8	02	169.4	110.0	52	211.3	137.2
3	02.5	01.6	53	44.4	28.9	03	86.4	56.1	53	128.3	83.3	03	170.2	110.6	53	212.2	137.8
4	03.4	02.2	54	45.3	29.4	04	87.2	56.6	54	129.1	83.9	04	171.1	111.1	54	213.0	138.3
5	04.2	02.7	55	46.1	30.0	05	88.1	57.2	55	130.0	84.4	05	171.9	111.6	55	213.8	138.9
6	05.0	03.3	56	47.0	30.5	106	88.9	57.7	156	130.8	85.0	206	172.8	112.2	256	214.7	139.4
7	05.9	03.8	57	47.8	31.0	07	89.7	58.3	57	131.7	85.5	07	173.6	112.7	57	215.5	140.0
8	06.7	04.3	58	48.6	31.6	08	90.6	58.8	58	132.5	86.0	08	174.4	113.3	58	216.4	140.5
9	07.5	04.9	59	49.5	32.1	09	91.4	59.4	59	133.3	86.6	09	175.3	113.8	59	217.2	141.1
10	08.4	05.4	60	50.3	32.7	10	92.2	59.9	60	134.2	87.1	10	176.1	114.4	60	218.0	141.6
11	09.2	06.0	61	51.2	33.2	111	93.1	60.5	161	135.0	87.7	211	176.9	114.9	261	218.9	142.1
12	10.1	06.5	62	52.0	33.8	12	93.9	61.0	62	135.9	88.2	12	177.8	115.5	62	219.7	142.7
13	10.9	07.1	63	52.8	34.3	13	94.8	61.5	63	136.7	88.8	13	178.6	116.0	63	220.6	143.2
14	11.7	07.6	64	53.7	34.9	14	95.6	62.1	64	137.5	89.3	14	179.5	116.5	64	221.4	143.8
15	12.6	08.2	65	54.5	35.4	15	96.4	62.6	65	138.4	89.9	15	180.3	117.1	65	222.2	144.3
16	13.4	08.7	66	55.3	35.9	116	97.3	63.2	166	139.2	90.4	216	181.1	117.6	266	223.1	144.9
17	14.3	09.3	67	56.2	36.5	17	98.1	63.7	67	140.0	90.9	17	182.0	118.2	67	223.9	145.4
18	15.1	09.8	68	57.0	37.0	18	99.0	64.3	68	140.9	91.5	18	182.8	118.7	68	224.7	146.0
19	15.9	10.3	69	57.9	37.6	19	99.8	64.8	69	141.7	92.0	19	183.7	119.3	69	225.6	146.5
20	16.8	10.9	70	58.7	38.1	20	100.6	65.4	70	142.6	92.6	20	184.5	119.8	70	226.4	147.0
21	17.6	11.4	71	59.5	38.7	121	101.5	65.9	171	143.4	93.1	221	185.3	120.4	271	227.3	147.6
22	18.4	12.0	72	60.4	39.2	22	102.3	66.4	72	144.2	93.7	22	186.2	120.9	72	228.1	148.1
23	19.3	12.5	73	61.2	39.8	23	103.1	67.0	73	145.1	94.2	23	187.0	121.4	73	228.9	148.7
24	20.1	13.1	74	62.1	40.3	24	104.0	67.5	74	145.9	94.8	24	187.8	122.0	74	229.8	149.2
25	21.0	13.6	75	62.9	40.8	25	104.8	68.1	75	146.8	95.3	25	188.7	122.5	75	230.6	149.8
26	21.8	14.2	76	63.7	41.4	126	105.7	68.6	176	147.6	95.8	226	189.5	123.1	276	231.5	150.3
27	22.6	14.7	77	64.6	41.9	27	106.5	69.2	77	148.4	96.4	27	190.4	123.6	77	232.3	150.9
28	23.5	15.2	78	65.4	42.5	28	107.3	69.7	78	149.3	96.9	28	191.2	124.2	78	233.1	151.4
29	24.3	15.8	79	66.2	43.0	29	108.2	70.3	79	150.1	97.5	29	192.0	124.7	79	234.0	151.9
30	25.2	16.3	80	67.1	43.6	30	109.0	70.8	80	150.9	98.0	30	192.9	125.3	80	234.8	152.5
31	26.0	16.9	81	67.9	44.1	131	109.9	71.3	181	151.8	98.6	231	193.7	125.8	281	235.6	153.0
32	26.8	17.4	82	68.8	44.7	32	110.7	71.9	82	152.6	99.1	32	194.6	126.3	82	236.5	153.6
33	27.7	18.0	83	69.6	45.2	33	111.5	72.4	83	153.5	99.7	33	195.4	126.9	83	237.3	154.1
34	28.5	18.5	84	70.4	45.7	34	112.4	73.0	84	154.3	100.2	34	196.2	127.4	84	238.2	154.7
35	29.4	19.1	85	71.3	46.3	35	113.2	73.5	85	155.1	100.8	35	197.1	128.0	85	239.0	155.2
36	30.2	19.6	86	72.1	46.8	136	114.0	74.1	186	156.0	101.3	236	197.9	128.5	286	239.8	155.8
37	31.0	20.2	87	73.0	47.4	37	114.9	74.6	87	156.8	101.8	37	198.7	129.1	87	240.7	156.3
38	31.9	20.7	88	73.8	47.9	38	115.7	75.2	88	157.7	102.4	38	199.6	129.6	88	241.5	156.8
39	32.7	21.2	89	74.6	48.5	39	116.6	75.7	89	158.5	102.9	39	200.4	130.2	89	242.4	157.4
40	33.5	21.8	90	75.5	49.0	40	117.4	76.2	90	159.3	103.5	40	201.3	130.7	90	243.2	157.9
41	34.4	22.3	91	76.3	49.6	141	118.2	76.8	191	160.2	104.0	241	202.1	131.2	291	244.0	158.5
42	35.2	22.9	92	77.2	50.1	42	119.1	77.3	92	161.0	104.6	42	202.9	131.8	92	244.9	159.0
43	36.1	23.4	93	78.0	50.6	43	119.9	77.9	93	161.8	105.1	43	203.8	132.3	93	245.7	159.6
44	36.9	24.0	94	78.8	51.2	44	120.8	78.4	94	162.7	105.7	44	204.6	132.9	94	246.5	160.1
45	37.7	24.5	95	79.7	51.7	45	121.6	79.0	95	163.5	106.2	45	205.5	133.4	95	247.4	160.7
46	38.6	25.1	96	80.5	52.3	146	122.4	79.5	196	164.4	106.7	246	206.3	134.0	296	248.2	161.2
47	39.4	25.6	97	81.3	52.8	47	123.3	80.1	97	165.2	107.3	47	207.1	134.5	97	249.1	161.7
48	40.3	26.1	98	82.2	53.4	48	124.1	80.6	98	166.0	107.8	48	208.0	135.1	98	249.9	162.3
49	41.1	26.7	99	83.0	53.9	49	125.0	81.1	99	166.9	108.4	49	208.8	135.6	99	250.7	162.8
50	41.9	27.2	100	83.9	54.5	150	125.8	81.7	200	167.7	108.9	250	209.7	136.2	300	251.6	163.4
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

for 57 Deg.



# 34 Difference of Latitude and Departure for 34 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	42.3	28.5	101	83.7	56.5	151	125.2	84.4	201	166.6	112.4	251	208.1	140.4
2	01.7	01.1	52	43.1	29.1	02	84.6	57.0	52	126.0	85.0	02	167.5	113.0	52	208.9	140.9
3	02.5	01.7	53	43.9	29.6	03	85.4	57.6	53	126.8	85.6	03	168.3	113.5	53	209.7	141.5
4	03.3	02.2	54	44.8	30.2	04	86.2	58.2	54	127.7	86.1	04	169.1	114.1	54	210.6	142.0
5	04.1	02.8	55	45.6	30.8	05	87.0	58.7	55	128.5	86.7	05	169.9	114.6	55	211.4	142.6
6	05.0	03.4	56	46.4	31.3	106	87.9	59.3	156	129.3	87.2	206	170.8	115.2	256	212.2	143.2
7	05.8	03.9	57	47.3	31.9	07	88.7	59.8	57	130.2	87.8	07	171.6	115.8	57	213.1	143.7
8	06.6	04.5	58	48.1	32.4	08	89.5	60.4	58	131.0	88.4	08	172.4	116.3	58	213.9	144.3
9	07.5	05.0	59	48.9	33.0	09	90.4	61.0	59	131.8	88.9	09	173.3	116.9	59	214.7	144.8
10	08.3	05.6	60	49.7	33.6	10	91.2	61.5	60	132.6	89.5	10	174.1	117.4	60	215.5	145.4
11	09.1	06.2	61	50.6	34.1	111	92.0	62.1	161	133.5	90.0	211	174.9	118.0	261	216.4	146.0
12	09.9	06.7	62	51.4	34.7	12	92.8	62.6	62	134.3	90.6	12	175.7	118.6	62	217.2	146.5
13	10.8	07.3	63	52.2	35.2	13	93.7	63.2	63	135.1	91.1	13	176.6	119.1	63	218.0	147.1
14	11.6	07.8	64	53.1	35.8	14	94.5	63.7	64	136.0	91.7	14	177.4	119.7	64	218.9	147.6
15	12.4	08.4	65	53.9	36.3	15	95.3	64.3	65	136.8	92.3	15	178.2	120.2	65	219.7	148.2
16	13.3	08.9	66	54.7	36.9	116	96.2	64.9	166	137.6	92.8	216	179.1	120.8	266	220.5	148.7
17	14.1	09.5	67	55.5	37.5	17	97.0	65.4	67	138.4	93.4	17	179.9	121.3	67	221.3	149.3
18	14.9	10.1	68	56.4	38.0	18	97.8	66.0	68	139.3	93.9	18	180.7	121.9	68	222.2	149.9
19	15.8	10.6	69	57.2	38.6	19	98.7	66.5	69	140.1	94.5	19	181.6	122.5	69	223.0	150.4
20	16.6	11.2	70	58.0	39.1	20	99.5	67.1	70	140.9	95.1	20	182.4	123.0	70	223.8	151.0
21	17.4	11.7	71	58.9	39.7	121	100.3	67.7	171	141.8	95.6	221	183.2	123.6	271	224.7	151.5
22	18.2	12.3	72	59.7	40.3	22	101.1	68.2	72	142.6	96.2	22	184.0	124.1	72	225.5	152.1
23	19.1	12.9	73	60.5	40.8	23	102.0	68.8	73	143.4	96.7	23	184.9	124.7	73	226.3	152.7
24	19.9	13.4	74	61.3	41.4	24	102.8	69.3	74	144.2	97.3	24	185.7	125.3	74	227.1	153.2
25	20.7	14.0	75	62.2	41.9	25	103.6	69.9	75	145.1	97.9	25	186.5	125.8	75	228.0	153.8
26	21.6	14.5	76	63.0	42.5	126	104.5	70.5	176	145.9	98.4	226	187.4	126.4	276	228.8	154.3
27	22.4	15.1	77	63.8	43.1	27	105.3	71.0	77	146.7	99.0	27	188.2	126.9	77	229.6	154.9
28	23.2	15.7	78	64.7	43.6	28	106.1	71.6	78	147.6	99.5	28	189.0	127.5	78	230.5	155.5
29	24.0	16.2	79	65.5	44.2	29	106.9	72.1	79	148.4	100.1	29	189.8	128.1	79	231.3	156.0
30	24.9	16.7	80	66.3	44.7	30	107.8	72.7	80	149.2	100.7	30	190.7	128.6	80	232.1	156.6
31	25.7	17.3	81	67.1	45.3	131	108.6	73.3	181	150.0	101.2	231	191.5	129.2	281	232.9	157.1
32	26.5	17.9	82	68.0	45.9	32	109.4	73.8	82	150.9	101.8	32	192.3	129.7	82	233.8	157.7
33	27.4	18.5	83	68.8	46.4	33	110.3	74.4	83	151.7	102.3	33	193.2	130.3	83	234.6	158.3
34	28.2	19.0	84	69.6	47.0	34	111.1	74.9	84	152.5	102.9	34	194.0	130.9	84	235.4	158.8
35	29.0	19.6	85	70.5	47.5	35	111.9	75.5	85	153.4	103.5	35	194.8	131.4	85	236.3	159.4
36	29.8	20.1	86	71.3	48.1	136	112.7	76.1	186	154.2	104.0	236	195.6	132.0	286	237.1	159.9
37	30.7	20.7	87	72.1	48.7	37	113.6	76.6	87	155.0	104.6	37	196.5	132.5	87	237.9	160.5
38	31.5	21.2	88	73.0	49.2	38	114.4	77.2	88	155.9	105.1	38	197.3	133.1	88	238.8	161.0
39	32.3	21.8	89	73.8	49.8	39	115.2	77.7	89	156.7	105.7	39	198.1	133.6	89	239.6	161.6
40	33.2	22.4	90	74.6	50.3	40	116.1	78.2	90	157.5	106.2	40	199.0	134.2	90	240.4	162.2
41	34.0	22.9	91	75.4	50.9	141	116.9	78.8	191	158.3	106.8	241	199.8	134.8	291	241.2	162.7
42	34.8	23.5	92	76.3	51.4	42	117.7	79.4	92	159.2	107.4	42	200.6	135.3	92	242.1	163.3
43	35.6	24.0	93	77.1	52.0	43	118.5	80.0	93	160.0	107.9	43	201.4	135.9	93	242.9	163.8
44	36.5	24.6	94	77.9	52.6	44	119.4	80.5	94	160.8	108.5	44	202.3	136.4	94	243.7	164.4
45	37.3	25.2	95	78.8	53.1	45	120.2	81.1	95	161.7	109.0	45	203.1	137.0	95	244.6	165.0
46	38.1	25.7	96	79.6	53.7	146	121.0	81.6	196	162.5	109.6	246	203.9	137.6	296	245.4	165.5
47	39.0	26.3	97	80.4	54.2	47	121.9	82.2	97	163.3	110.2	47	204.8	138.1	97	246.2	166.1
48	39.8	26.8	98	81.2	54.8	48	122.7	82.8	98	164.1	110.7	48	205.6	138.7	98	247.0	166.6
49	40.6	27.4	99	82.1	55.4	49	123.5	83.3	99	165.0	111.3	49	206.4	139.2	99	247.9	167.2
50	41.5	28.0	100	82.9	55.9	150	124.4	83.9	200	165.8	111.8	250	207.3	139.8	300	248.7	167.8
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 56 Deg.

# Difference of Latitude and Departure for 35 Deg.

35

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.8	00.6	51	41.8	29.2	101	82.7	57.9	151	123.7	86.6	201	164.6	115.3	251	205.6	143.9
2	01.6	01.1	52	42.6	29.8	02	83.5	58.5	52	124.5	87.2	02	165.4	115.8	52	206.4	144.5
3	02.5	01.7	53	43.4	30.4	03	84.4	59.1	53	125.3	87.7	03	166.3	116.4	53	207.2	145.1
4	03.3	02.3	54	44.2	31.0	04	85.2	59.6	54	126.1	88.3	04	167.1	117.0	54	208.0	145.7
5	04.1	02.9	55	45.0	31.5	05	86.0	60.2	55	126.9	88.9	05	167.9	117.6	55	208.8	146.2
6	04.9	03.4	56	45.9	32.1	106	86.8	60.8	156	127.8	89.5	206	168.7	118.1	256	209.6	146.8
7	05.7	04.0	57	46.7	32.7	07	87.6	61.4	57	128.6	90.0	07	169.5	118.7	57	210.5	147.4
8	06.6	04.6	58	47.5	33.3	08	88.5	61.9	58	129.4	90.6	08	170.3	119.3	58	211.3	148.0
9	07.4	05.2	59	48.3	33.8	09	89.3	62.5	59	130.2	91.2	09	171.2	119.9	59	212.1	148.5
10	08.2	05.7	60	49.1	34.4	10	90.1	63.1	60	131.0	91.8	10	172.0	120.4	60	212.9	149.1
11	09.0	06.3	61	50.0	35.0	111	90.9	63.7	161	131.9	92.3	211	172.8	121.0	261	213.8	149.7
12	09.8	06.9	62	50.8	35.6	12	91.7	64.2	62	132.7	92.9	12	173.6	121.6	62	214.6	150.3
13	10.6	07.5	63	51.6	36.1	13	92.5	64.8	63	133.5	93.5	13	174.4	122.2	63	215.4	150.8
14	11.5	08.0	64	52.4	36.7	14	93.4	65.4	64	134.3	94.1	14	175.3	122.7	64	216.2	151.4
15	12.3	08.6	65	53.2	37.3	15	94.2	66.0	65	135.1	94.6	15	176.1	123.3	65	217.0	152.0
16	13.1	09.2	66	54.1	37.9	116	95.0	66.5	166	136.0	95.2	216	176.9	123.9	266	217.8	152.6
17	13.9	09.7	67	54.9	38.4	17	95.8	67.1	67	136.8	95.8	17	177.7	124.4	67	218.7	153.1
18	14.7	10.3	68	55.7	39.0	18	96.6	67.7	68	137.6	96.3	18	178.5	125.0	68	219.5	153.7
19	15.6	10.9	69	56.5	39.6	19	97.5	68.2	69	138.4	96.9	19	179.4	125.6	69	220.3	154.3
20	16.4	11.5	70	57.3	40.1	20	98.3	68.8	70	139.2	97.5	20	180.2	126.2	70	221.1	154.8
21	17.2	12.0	71	58.1	40.7	121	99.1	69.4	171	140.0	98.1	221	181.0	126.7	271	221.9	155.4
22	18.0	12.6	72	59.0	41.3	22	99.9	70.0	72	140.9	98.6	22	181.8	127.3	72	222.8	156.0
23	18.8	13.2	73	59.8	41.9	23	100.7	70.5	73	141.7	99.2	23	182.6	127.9	73	223.6	156.6
24	19.6	13.8	74	60.6	42.4	24	101.6	71.1	74	142.5	99.8	24	183.5	128.5	74	224.4	157.1
25	20.5	14.3	75	61.4	43.0	25	102.4	71.7	75	143.3	100.4	25	184.3	129.0	75	225.2	157.7
26	21.3	14.9	76	62.2	43.6	126	103.2	72.3	176	144.1	100.9	226	185.1	129.6	276	226.0	158.3
27	22.1	15.5	77	63.1	44.2	27	104.0	72.8	77	145.0	101.5	27	185.9	130.2	77	226.9	158.9
28	22.9	16.1	78	63.9	44.7	28	104.8	73.4	78	145.8	102.1	28	186.7	130.8	78	227.7	159.4
29	23.8	16.6	79	64.7	45.3	29	105.6	74.0	79	146.6	102.7	29	187.5	131.3	79	228.5	160.0
30	24.6	17.2	80	65.5	45.9	30	106.5	74.6	80	147.4	103.2	30	188.4	131.9	80	229.3	160.6
31	25.4	17.8	81	66.3	46.5	131	107.3	75.1	181	148.2	103.8	231	189.2	132.5	281	230.1	161.2
32	26.2	18.4	82	67.2	47.0	32	108.1	75.7	82	149.1	104.4	32	190.0	133.1	82	231.0	161.7
33	27.0	18.9	83	68.0	47.6	33	108.9	76.3	83	149.9	105.0	33	190.8	133.6	83	231.8	162.3
34	27.8	19.5	84	68.8	48.2	34	109.7	76.8	84	150.7	105.5	34	191.6	134.2	84	232.6	162.9
35	28.7	20.1	85	69.6	48.7	35	110.6	77.4	85	151.5	106.1	35	192.5	134.8	85	233.4	163.4
36	29.5	20.6	86	70.4	49.3	136	111.4	78.0	186	152.3	106.7	236	193.3	135.3	286	234.2	164.0
37	30.3	21.2	87	71.3	49.9	37	112.2	78.6	87	153.1	107.2	37	194.1	135.9	87	235.0	164.6
38	31.1	21.8	88	72.1	50.5	38	113.0	79.1	88	154.0	107.8	38	194.9	136.5	88	235.9	165.2
39	31.9	22.4	89	72.9	51.0	39	113.8	79.7	89	154.8	108.4	39	195.7	137.1	89	236.7	165.7
40	32.8	22.9	90	73.7	51.6	40	114.6	80.3	90	155.6	109.0	40	196.6	137.6	90	237.5	166.3
41	33.6	23.5	91	74.5	52.2	141	115.5	80.9	191	156.4	109.5	241	197.4	138.2	291	238.3	166.9
42	34.4	24.1	92	75.3	52.8	42	116.3	81.4	92	157.2	110.1	42	198.2	138.8	92	239.1	167.5
43	35.2	24.7	93	76.2	53.3	43	117.1	82.0	93	158.1	110.7	43	199.0	139.4	93	240.0	168.0
44	36.0	25.2	94	77.0	53.9	44	117.9	82.6	94	158.9	111.3	44	199.8	139.9	94	240.8	168.6
45	36.9	25.8	95	77.8	54.5	45	118.8	83.2	95	159.7	111.8	45	200.6	140.5	95	241.6	169.2
46	37.7	26.4	96	78.6	55.1	146	119.6	83.7	196	160.5	112.4	246	201.5	141.1	296	242.4	169.8
47	38.5	27.0	97	79.4	55.6	47	120.4	84.3	97	161.3	113.0	47	202.3	141.7	97	243.2	170.3
48	39.3	27.5	98	80.3	56.2	48	121.2	84.9	98	162.2	113.6	48	203.1	142.2	98	244.1	170.9
49	40.1	28.1	99	81.1	56.8	49	122.0	85.5	99	163.0	114.1	49	203.9	142.8	99	244.9	171.5
50	41.0	28.7	100	81.9	57.4	150	122.8	86.0	200	163.8	114.7	250	204.7	143.4	300	245.7	172.1
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

for 55 Deg.



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	41.3	30.0	101	81.7	59.4	151	122.2	88.8	201	162.6	118.1	251	203.1	147.5
2	01.6	01.2	52	42.1	30.6	02	82.5	60.0	52	123.0	89.3	02	163.4	118.7	52	203.9	148.1
3	02.4	01.8	53	42.9	31.2	03	83.3	60.5	53	123.8	89.9	03	164.2	119.3	53	204.7	148.7
4	03.2	02.4	54	43.7	31.7	04	84.1	61.1	54	124.6	90.5	04	165.0	119.9	54	205.5	149.3
5	04.0	02.9	55	44.5	32.3	05	84.9	61.7	55	125.4	91.1	05	165.8	120.5	55	206.3	149.9
6	04.9	03.5	56	45.3	32.9	106	85.8	62.3	156	126.2	91.7	206	166.7	121.1	256	207.1	150.5
7	05.7	04.1	57	46.1	33.5	07	86.6	62.9	57	127.0	92.3	07	167.5	121.7	57	207.9	151.1
8	06.5	04.7	58	46.9	34.1	08	87.4	63.5	58	127.8	92.9	08	168.3	122.3	58	208.7	151.7
9	07.3	05.3	59	47.7	34.7	09	88.2	64.1	59	128.6	93.5	09	169.1	122.8	59	209.5	152.2
10	08.1	05.9	60	48.5	35.3	10	89.0	64.7	60	129.4	94.0	10	169.9	123.4	60	210.3	152.8
11	08.9	06.5	61	49.3	35.9	111	89.8	65.2	161	130.2	94.6	211	170.7	124.0	261	211.1	153.4
12	09.7	07.1	62	50.2	36.4	12	90.6	65.8	62	131.1	95.2	12	171.5	124.6	62	212.0	154.0
13	10.5	07.6	63	51.0	37.0	13	91.4	66.4	63	131.9	95.8	13	172.3	125.2	63	212.8	154.6
14	11.3	08.2	64	51.8	37.6	14	92.2	67.0	64	132.7	96.4	14	173.1	125.8	64	213.6	155.2
15	12.1	08.8	65	52.6	38.2	15	93.0	67.6	65	133.5	97.0	15	173.9	126.4	65	214.4	155.8
16	12.9	09.4	66	53.4	38.8	116	93.8	68.2	166	134.3	97.6	216	174.7	127.0	266	215.2	156.4
17	13.8	10.0	67	54.2	39.4	17	94.7	68.8	67	135.1	98.2	17	175.6	127.6	67	216.0	156.9
18	14.6	10.6	68	55.0	40.0	18	95.5	69.4	68	135.9	98.7	18	176.4	128.1	68	216.8	157.5
19	15.4	11.2	69	55.8	40.6	19	96.3	69.9	69	136.7	99.3	19	177.2	128.7	69	217.6	158.1
20	16.2	11.8	70	56.6	41.1	20	97.1	70.5	70	137.5	99.9	20	178.0	129.3	70	218.4	158.7
21	17.0	12.3	71	57.4	41.7	121	97.9	71.1	171	138.3	100.5	221	178.8	129.9	271	219.2	159.3
22	17.8	12.9	72	58.2	42.3	22	98.7	71.7	72	139.1	101.1	22	179.6	130.5	72	220.0	159.9
23	18.6	13.5	73	59.1	42.9	23	99.5	72.3	73	140.0	101.7	23	180.4	131.1	73	220.9	160.5
24	19.4	14.1	74	59.9	43.5	24	100.3	72.9	74	140.8	102.3	24	181.2	131.7	74	221.7	161.1
25	20.2	14.7	75	60.7	44.1	25	101.1	73.5	75	141.6	102.9	25	182.0	132.3	75	222.5	161.6
26	21.0	15.3	76	61.5	44.7	126	101.9	74.1	176	142.4	103.5	226	182.8	132.8	276	223.3	162.2
27	21.8	15.9	77	62.3	45.3	27	102.7	74.7	77	143.2	104.0	27	183.6	133.4	77	224.1	162.8
28	22.7	16.5	78	63.1	45.8	28	103.6	75.2	78	144.0	104.6	28	184.5	134.0	78	224.9	163.4
29	23.5	17.0	79	63.9	46.4	29	104.4	75.8	79	144.8	105.2	29	185.3	134.6	79	225.7	164.0
30	24.3	17.6	80	64.7	47.0	30	105.2	76.4	80	145.6	105.8	30	186.1	135.2	80	226.5	164.6
31	25.1	18.2	81	65.5	47.6	131	106.0	77.0	181	146.4	106.4	231	186.9	135.8	281	227.3	165.2
32	25.9	18.8	82	66.3	48.2	32	106.8	77.6	82	147.2	107.0	32	187.7	136.4	82	228.1	165.8
33	26.7	19.4	83	67.1	48.8	33	107.6	78.2	83	148.0	107.6	33	188.5	137.0	83	228.9	166.3
34	27.5	20.0	84	68.0	49.4	34	108.4	78.8	84	148.9	108.2	34	189.3	137.5	84	229.8	166.9
35	28.3	20.6	85	68.8	50.0	35	109.2	79.4	85	149.7	108.7	35	190.1	138.1	85	230.6	167.5
36	29.1	21.2	86	69.6	50.6	136	110.0	79.9	186	150.5	109.3	236	190.9	138.7	286	231.4	168.1
37	29.9	21.7	87	70.4	51.1	37	110.8	80.5	87	151.3	109.9	37	191.7	139.3	87	232.2	168.7
38	30.7	22.3	88	71.2	51.7	38	111.6	81.1	88	152.1	110.5	38	192.5	139.9	88	233.0	169.3
39	31.6	22.9	89	72.0	52.3	39	112.5	81.7	89	152.9	111.1	39	193.3	140.5	89	233.8	169.9
40	32.4	23.5	90	72.8	52.9	40	113.3	82.3	90	153.7	111.7	40	194.2	141.1	90	234.6	170.5
41	33.2	24.1	91	73.6	53.5	141	114.1	82.9	191	154.5	112.3	241	195.0	141.7	291	235.4	171.0
42	34.0	24.7	92	74.4	54.1	42	114.9	83.5	92	155.3	112.9	42	195.8	142.2	92	236.2	171.6
43	34.8	25.3	93	75.2	54.7	43	115.7	84.1	93	156.1	113.4	43	196.6	142.8	93	237.0	172.2
44	35.6	25.9	94	76.0	55.3	44	116.5	84.6	94	156.9	114.0	44	197.4	143.4	94	237.8	172.8
45	36.4	26.5	95	76.9	55.8	45	117.3	85.2	95	157.8	114.6	45	198.2	144.0	95	238.7	173.4
46	37.2	27.0	96	77.7	56.4	146	118.1	85.8	196	158.6	115.2	246	199.0	144.6	296	239.5	174.0
47	38.0	27.6	97	78.5	57.0	47	118.9	86.4	97	159.4	115.8	47	199.8	145.2	97	240.3	174.6
48	38.8	28.2	98	79.3	57.6	48	119.7	87.0	98	160.2	116.4	48	200.6	145.8	98	241.1	175.2
49	39.6	28.8	99	80.1	58.2	49	120.5	87.6	99	161.0	117.0	49	201.4	146.4	99	241.9	175.7
50	40.5	29.4	100	80.9	58.8	150	121.3	88.2	200	161.8	117.6	250	202.2	146.9	300	242.7	176.3
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 54 Deg.

# *Difference of Latitude and Departure for 37 Deg.*

37

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	40.7	30.7	101	80.7	60.8	151	120.6	90.9	201	160.5	121.0	251	200.4	151.0
2	01.6	01.2	52	41.5	31.3	02	81.5	61.4	52	121.4	91.5	02	161.3	121.6	52	201.2	151.6
3	02.4	01.8	53	42.3	31.9	03	82.3	62.0	53	122.2	92.1	03	162.1	122.2	53	202.0	152.2
4	03.2	02.4	54	43.1	32.5	04	83.1	62.6	54	123.0	92.7	04	162.9	122.8	54	202.8	152.9
5	04.0	03.0	55	43.9	33.1	05	83.9	63.2	55	123.8	93.3	05	163.7	123.4	55	203.6	153.5
6	04.8	03.6	56	44.7	33.7	106	84.7	63.8	156	124.6	93.9	206	164.5	124.0	256	204.4	154.1
7	05.6	04.2	57	45.5	34.3	07	85.5	64.4	57	125.4	94.5	07	165.3	124.6	57	205.2	154.7
8	06.4	04.8	58	46.3	34.9	08	86.2	65.0	58	126.2	95.1	08	166.1	125.2	58	206.0	155.3
9	07.2	05.4	59	47.1	35.5	09	87.0	65.6	59	127.0	95.7	09	166.9	125.8	59	206.8	155.9
10	08.0	06.0	60	47.9	36.1	10	87.8	66.2	60	127.8	96.3	10	167.7	126.4	60	207.6	156.5
11	08.8	06.6	61	48.7	36.7	111	88.6	66.8	161	128.6	96.9	211	168.5	127.0	261	208.4	157.1
12	09.6	07.2	62	49.5	37.3	12	89.4	67.4	62	129.4	97.5	12	169.3	127.6	62	209.2	157.7
13	10.4	07.8	63	50.3	37.9	13	90.2	68.0	63	130.2	98.1	13	170.1	128.2	63	210.0	158.3
14	11.2	08.4	64	51.1	38.5	14	91.0	68.6	64	131.0	98.7	14	170.9	128.8	64	210.8	158.9
15	12.0	09.0	65	51.9	39.1	15	91.8	69.2	65	131.8	99.3	15	171.7	129.4	65	211.6	159.5
16	12.8	09.6	66	52.7	39.7	116	92.6	69.8	166	132.6	99.9	216	172.5	130.0	266	212.4	160.1
17	13.6	10.2	67	53.5	40.3	17	93.4	70.4	67	133.4	100.5	17	173.3	130.6	67	213.2	160.7
18	14.4	10.8	68	54.3	40.9	18	94.2	71.0	68	134.2	101.1	18	174.1	131.2	68	214.0	161.3
19	15.2	11.4	69	55.1	41.5	19	95.0	71.6	69	135.0	101.7	19	174.9	131.8	69	214.8	161.9
20	16.0	12.0	70	55.9	42.1	20	95.8	72.2	70	135.8	102.3	20	175.7	132.4	70	215.6	162.5
21	16.8	12.6	71	56.7	42.7	121	96.6	72.8	171	136.6	102.9	221	176.5	133.0	271	216.4	163.1
22	17.6	13.2	72	57.5	43.3	22	97.4	73.4	72	137.4	103.5	22	177.3	133.6	72	217.2	163.7
23	18.4	13.8	73	58.3	43.9	23	98.2	74.0	73	138.2	104.1	23	178.1	134.2	73	218.0	164.3
24	19.2	14.4	74	59.1	44.5	24	99.0	74.6	74	139.0	104.7	24	178.9	134.8	74	218.8	164.9
25	20.0	15.0	75	59.9	45.1	25	99.8	75.2	75	139.8	105.3	25	179.7	135.4	75	219.6	165.5
26	20.8	15.6	76	60.7	45.7	126	100.6	75.8	176	140.6	105.9	226	180.5	136.0	276	220.4	166.1
27	21.6	16.2	77	61.5	46.3	27	101.4	76.4	77	141.4	106.5	27	181.3	136.6	77	221.2	166.7
28	22.4	16.9	78	62.3	46.9	28	102.2	77.0	78	142.2	107.1	28	182.1	137.2	78	222.0	167.3
29	23.2	17.5	79	63.1	47.5	29	103.0	77.6	79	142.9	107.7	29	182.9	137.8	79	222.8	167.9
30	24.0	18.1	80	63.9	48.1	30	103.8	78.2	80	143.7	108.3	30	183.7	138.4	80	223.6	168.5
31	24.8	18.7	81	64.7	48.7	131	104.6	78.8	181	144.5	108.9	231	184.5	139.0	281	224.4	169.1
32	25.6	19.3	82	65.5	49.3	32	105.4	79.4	82	145.3	109.5	32	185.3	139.6	82	225.2	169.7
33	26.4	19.9	83	66.3	49.9	33	106.2	80.0	83	146.1	110.1	33	186.1	140.2	83	226.0	170.3
34	27.2	20.5	84	67.1	50.6	34	107.0	80.6	84	146.9	110.7	34	186.9	140.8	84	226.8	170.9
35	28.0	21.1	85	67.9	51.2	35	107.8	81.2	85	147.7	111.3	35	187.7	141.4	85	227.6	171.5
36	28.7	21.7	86	68.7	51.8	136	108.6	81.8	186	148.5	111.9	236	188.5	142.0	286	228.4	172.1
37	29.5	22.3	87	69.5	52.4	37	109.4	82.4	87	149.3	112.5	37	189.3	142.6	87	229.2	172.7
38	30.3	22.9	88	70.3	53.0	38	110.2	83.0	88	150.1	113.1	38	190.1	143.2	88	230.0	173.3
39	31.1	23.5	89	71.1	53.6	39	111.0	83.6	89	150.9	113.7	39	190.9	143.8	89	230.8	173.9
40	31.9	24.1	90	71.9	54.2	40	111.8	84.2	90	151.7	114.3	40	191.7	144.4	90	231.6	174.5
41	32.7	24.7	91	72.7	54.8	141	112.6	84.9	191	152.5	114.9	241	192.5	145.0	291	232.4	175.1
42	33.5	25.3	92	73.5	55.4	42	113.4	85.5	92	153.3	115.5	42	193.3	145.6	92	233.2	175.7
43	34.3	25.9	93	74.3	56.0	43	114.2	86.1	93	154.1	116.1	43	194.1	146.2	93	234.0	176.3
44	35.1	26.5	94	75.1	56.6	44	115.0	86.7	94	154.9	116.7	44	194.9	146.8	94	234.8	176.9
45	35.9	27.1	95	75.9	57.2	45	115.8	87.3	95	155.7	117.3	45	195.7	147.4	95	235.6	177.5
46	36.7	27.7	96	76.7	57.8	146	116.6	87.9	196	156.5	117.9	246	196.5	148.0	296	236.4	178.1
47	37.5	28.3	97	77.5	58.4	47	117.4	88.5	97	157.3	118.5	47	197.3	148.6	97	237.2	178.7
48	38.3	28.9	98	78.3	59.0	48	118.2	89.1	98	158.1	119.1	48	198.1	149.2	98	238.0	179.3
49	39.1	29.5	99	79.1	59.6	49	119.0	89.7	99	158.9	119.7	49	198.9	149.8	99	238.8	179.9
50	39.9	30.1	100	79.9	60.2	150	119.8	90.3	200	159.7	120.3	250	199.7	150.4	300	239.6	180.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 53 Deg.



Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.8	00.6	51	40.2	31.4	101	79.6	62.2	151	119.0	93.0	201	158.4	123.8	251	197.8	154.5
2	01.6	01.2	52	41.0	32.0	02	80.4	62.8	52	119.8	93.6	02	159.2	124.4	52	198.5	155.2
3	02.4	01.8	53	41.8	32.6	03	81.2	63.4	53	120.5	94.2	03	159.9	125.0	53	199.3	155.8
4	03.2	02.5	54	42.5	33.2	04	81.9	64.0	54	121.3	94.8	04	160.7	125.6	54	200.1	156.4
5	03.9	03.1	55	43.3	33.9	05	82.7	64.6	55	122.1	95.4	05	161.5	126.2	55	200.9	157.0
6	04.7	03.7	56	44.1	34.5	106	83.5	65.3	156	122.9	96.0	206	162.3	126.8	256	201.7	157.6
7	05.5	04.3	57	44.9	35.1	07	84.3	65.9	57	123.7	96.7	07	163.1	127.4	57	202.5	158.2
8	06.3	04.9	58	45.7	35.7	08	85.1	66.5	58	124.5	97.3	08	163.9	128.1	58	203.3	158.9
9	07.1	05.5	59	46.5	36.3	09	85.9	67.1	59	125.3	97.9	09	164.7	128.7	59	204.1	159.5
10	07.9	06.2	60	47.3	36.9	10	86.7	67.7	60	126.1	98.5	10	165.5	129.3	60	204.9	160.1
11	08.7	06.8	61	48.1	37.6	111	87.5	68.3	161	126.9	99.1	211	166.2	129.9	261	205.6	160.7
12	09.5	07.4	62	48.9	38.2	12	88.2	69.0	62	127.6	99.7	12	167.0	130.5	62	206.4	161.3
13	10.2	08.0	63	49.6	38.8	13	89.0	69.6	63	128.4	100.4	13	167.8	131.1	63	207.2	161.9
14	11.0	08.6	64	50.4	39.4	14	89.8	70.2	64	129.2	101.0	14	168.6	131.8	64	208.0	162.5
15	11.8	09.2	65	51.2	40.0	15	90.6	70.8	65	130.0	101.6	15	169.4	132.4	65	208.8	163.2
16	12.6	09.9	66	52.0	40.6	116	91.4	71.4	166	130.8	102.2	216	170.2	133.0	266	209.6	163.8
17	13.4	10.5	67	52.8	41.3	17	92.2	72.0	67	131.6	102.8	17	171.0	133.6	67	210.4	164.4
18	14.2	11.1	68	53.6	41.9	18	93.0	72.7	68	132.4	103.4	18	171.8	134.2	68	211.2	165.0
19	15.0	11.7	69	54.4	42.5	19	93.8	73.3	69	133.2	104.1	19	172.5	134.8	69	211.9	165.6
20	15.8	12.3	70	55.2	43.1	20	94.5	73.9	70	133.9	104.7	20	173.3	135.5	70	212.7	166.2
21	16.5	12.9	71	55.9	43.7	121	95.3	74.5	171	134.7	105.3	221	174.1	136.1	271	213.5	166.9
22	17.3	13.5	72	56.7	44.3	22	96.1	75.1	72	135.5	105.9	22	174.9	136.7	72	214.3	167.5
23	18.1	14.2	73	57.5	44.9	23	96.9	75.7	73	136.3	106.5	23	175.7	137.3	73	215.1	168.1
24	18.9	14.8	74	58.3	45.6	24	97.7	76.3	74	137.1	107.1	24	176.5	137.9	74	215.9	168.7
25	19.7	15.4	75	59.1	46.2	25	98.5	77.0	75	137.9	107.7	25	177.3	138.5	75	216.7	169.3
26	20.5	16.0	76	59.9	46.8	126	99.3	77.6	176	138.7	108.4	226	178.1	139.1	276	217.5	169.9
27	21.3	16.6	77	60.7	47.4	27	100.1	78.2	77	139.5	109.0	27	178.9	139.8	77	218.2	170.5
28	22.1	17.2	78	61.5	48.0	28	100.9	78.8	78	140.2	109.6	28	179.6	140.4	78	219.0	171.2
29	22.9	17.9	79	62.2	48.6	29	101.6	79.4	79	141.0	110.2	29	180.4	141.0	79	219.8	171.8
30	23.6	18.5	80	63.0	49.3	30	102.4	80.0	80	141.8	110.8	30	181.2	141.6	80	220.6	172.4
31	24.4	19.1	81	63.8	49.9	131	103.2	80.7	181	142.6	111.4	231	182.0	142.2	281	221.4	173.0
32	25.2	19.7	82	64.6	50.5	32	104.0	81.3	82	143.4	112.1	32	182.8	142.8	82	222.2	173.6
33	26.0	20.3	83	65.4	51.1	33	104.8	81.9	83	144.2	112.7	33	183.6	143.5	83	223.0	174.2
34	26.8	20.9	84	66.2	51.7	34	105.6	82.5	84	145.0	113.3	34	184.4	144.1	84	223.8	174.9
35	27.6	21.5	85	67.0	52.3	35	106.4	83.1	85	145.8	113.9	35	185.2	144.7	85	224.5	175.5
36	28.4	22.2	86	67.8	53.0	136	107.2	83.7	186	146.5	114.5	236	185.9	145.3	286	225.3	176.1
37	29.2	22.8	87	68.5	53.6	37	107.9	84.4	87	147.3	115.1	37	186.7	145.9	87	226.1	176.7
38	29.9	23.4	88	69.3	54.2	38	108.7	85.0	88	148.1	115.8	38	187.5	146.5	88	226.9	177.3
39	30.7	24.0	89	70.1	54.8	39	109.5	85.6	89	148.9	116.4	39	188.3	147.2	89	227.7	177.9
40	31.5	24.6	90	70.9	55.4	40	110.3	86.2	90	149.7	117.0	40	189.1	147.8	90	228.5	178.6
41	32.3	25.2	91	71.7	56.0	141	111.1	86.8	191	150.5	117.6	241	189.9	148.4	291	229.3	179.2
42	33.1	25.9	92	72.5	56.6	42	111.9	87.4	92	151.3	118.2	42	190.7	149.0	92	230.1	179.8
43	33.9	26.5	93	73.3	57.3	43	112.7	88.0	93	152.1	118.8	43	191.5	149.6	93	230.9	180.4
44	34.7	27.1	94	74.1	57.9	44	113.5	88.7	94	152.9	119.4	44	192.2	150.2	94	231.6	181.0
45	35.5	27.7	95	74.9	58.5	45	114.2	89.3	95	153.6	120.1	45	193.0	150.8	95	232.4	181.6
46	36.2	28.3	96	75.6	59.1	146	115.0	89.9	196	154.4	120.7	246	193.8	151.5	296	233.2	182.2
47	37.0	28.9	97	76.4	59.7	47	115.8	90.5	97	155.2	121.3	47	194.6	152.1	97	234.0	182.9
48	37.8	29.6	98	77.2	60.3	48	116.6	91.1	98	156.0	121.9	48	195.4	152.7	98	234.8	183.5
49	38.6	30.2	99	78.0	61.0	49	117.4	91.7	99	156.8	122.5	49	196.2	153.3	99	235.6	184.1
50	39.4	30.8	100	78.8	61.6	150	118.2	92.4	200	157.6	123.1	250	197.0	153.9	300	236.4	184.7
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

for 52 Deg.

# Difference of Latitude and Departure for 39 Deg.

39

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	39.6	32.1	101	78.5	63.6	151	117.3	95.0	201	156.2	126.5	251	195.1	158.0
2	01.6	01.3	52	40.4	32.7	02	79.3	64.2	52	118.1	95.7	02	157.0	127.1	52	195.8	158.6
3	02.3	01.9	53	41.2	33.4	03	80.0	64.8	53	118.9	96.3	03	157.8	127.7	53	196.6	159.2
4	03.1	02.5	54	42.0	34.0	04	80.8	65.4	54	119.7	96.9	04	158.5	128.4	54	197.4	159.8
5	03.9	03.1	55	42.7	34.6	05	81.6	66.1	55	120.5	97.5	05	159.3	129.0	55	198.2	160.5
6	04.7	03.8	56	43.5	35.2	106	82.4	66.7	156	121.2	98.2	206	160.1	129.6	256	198.9	161.1
7	05.4	04.4	57	44.3	35.9	07	83.1	67.3	57	122.0	98.8	07	160.9	130.3	57	199.7	161.7
8	06.2	05.0	58	45.1	36.5	08	83.9	68.0	58	122.8	99.4	08	161.6	130.9	58	200.5	162.4
9	07.0	05.7	59	45.8	37.1	09	84.7	68.6	59	123.6	100.1	09	162.4	131.5	59	201.3	163.0
10	07.8	06.3	60	46.6	37.8	10	85.5	69.2	60	124.3	100.7	10	163.2	132.2	60	202.0	163.6
11	08.5	06.9	61	47.4	38.4	111	86.3	69.9	161	125.1	101.3	211	164.0	132.8	261	202.8	164.2
12	09.3	07.6	62	48.2	39.0	12	87.0	70.5	62	125.9	101.9	12	164.7	133.4	62	203.6	164.9
13	10.1	08.2	63	49.0	39.6	13	87.8	71.1	63	126.7	102.6	13	165.5	134.0	63	204.4	165.5
14	10.9	08.8	64	49.7	40.3	14	88.6	71.7	64	127.4	103.2	14	166.3	134.7	64	205.2	166.1
15	11.7	09.4	65	50.5	40.9	15	89.4	72.4	65	128.2	103.8	15	167.1	135.3	65	205.9	166.8
16	12.4	10.1	66	51.3	41.5	116	90.1	73.0	166	129.0	104.5	216	167.9	135.9	266	206.7	167.4
17	13.2	10.7	67	52.1	42.2	17	90.9	73.6	67	129.8	105.1	17	168.6	136.6	67	207.5	168.0
18	14.0	11.3	68	52.8	42.8	18	91.7	74.3	68	130.6	105.7	18	169.4	137.2	68	208.3	168.7
19	14.8	12.0	69	53.6	43.4	19	92.5	74.9	69	131.3	106.4	19	170.2	137.8	69	209.0	169.3
20	15.5	12.6	70	54.4	44.1	20	93.3	75.5	70	132.1	107.0	20	171.0	138.4	70	209.8	169.9
21	16.3	13.2	71	55.2	44.7	121	94.0	76.1	171	132.9	107.6	221	171.7	139.1	271	210.6	170.5
22	17.1	13.8	72	56.0	45.3	22	94.8	76.8	72	133.7	108.2	22	172.5	139.7	72	211.4	171.2
23	17.9	14.5	73	56.7	45.9	23	95.6	77.4	73	134.4	108.9	23	173.3	140.3	73	212.1	171.8
24	18.7	15.1	74	57.5	46.6	24	96.4	78.0	74	135.2	109.5	24	174.1	141.0	74	212.9	172.4
25	19.4	15.7	75	58.3	47.2	25	97.1	78.7	75	136.0	110.1	25	174.8	141.6	75	213.7	173.1
26	20.2	16.4	76	59.1	47.8	126	97.9	79.3	176	136.8	110.8	226	175.6	142.2	276	214.5	173.7
27	21.0	17.0	77	59.8	48.5	27	98.7	79.9	77	137.5	111.4	27	176.4	142.9	77	215.3	174.3
28	21.8	17.6	78	60.6	49.1	28	99.5	80.6	78	138.3	112.0	28	177.2	143.5	78	216.0	174.9
29	22.5	18.2	79	61.4	49.7	29	100.2	81.2	79	139.1	112.6	29	178.0	144.1	79	216.8	175.6
30	23.3	18.9	80	62.2	50.3	30	101.0	81.8	80	139.9	113.3	30	178.7	144.7	80	217.6	176.2
31	24.1	19.5	81	62.9	51.0	131	101.8	82.4	181	140.7	113.9	231	179.5	145.4	281	218.4	176.8
32	24.9	20.1	82	63.7	51.6	32	102.6	83.1	82	141.4	114.5	32	180.3	146.0	82	219.1	177.5
33	25.6	20.8	83	64.5	52.2	33	103.4	83.7	83	142.2	115.2	33	181.1	146.6	83	219.9	178.1
34	26.4	21.4	84	65.3	52.9	34	104.1	84.3	84	143.0	115.8	34	181.8	147.3	84	220.7	178.7
35	27.2	22.0	85	66.1	53.5	35	104.9	85.0	85	143.8	116.4	35	182.6	147.9	85	221.5	179.4
36	28.0	22.7	86	66.8	54.1	136	105.7	85.6	186	144.5	117.1	236	183.4	148.5	286	222.3	180.0
37	28.8	23.3	87	67.6	54.7	37	106.5	86.2	87	145.3	117.7	37	184.2	149.1	87	223.0	180.6
38	29.5	23.9	88	68.4	55.4	38	107.2	86.8	88	146.1	118.3	38	185.0	149.8	88	223.8	181.2
39	30.3	24.5	89	69.2	56.0	39	108.0	87.5	89	146.9	118.9	39	185.7	150.4	89	224.6	181.9
40	31.1	25.2	90	69.9	56.6	40	108.8	88.1	90	147.6	119.6	40	186.5	151.0	90	225.4	182.5
41	31.9	25.8	91	70.7	57.3	141	109.6	88.7	191	148.4	120.2	241	187.3	151.7	291	226.1	183.1
42	32.6	26.4	92	71.5	57.9	42	110.3	89.4	92	149.2	120.8	42	188.1	152.3	92	226.9	183.8
43	33.4	27.1	93	72.3	58.5	43	111.1	90.0	93	150.0	121.5	43	188.8	152.9	93	227.7	184.4
44	34.2	27.7	94	73.0	59.2	44	111.9	90.6	94	150.8	122.1	44	189.6	153.6	94	228.5	185.0
45	35.0	28.3	95	73.8	59.8	45	112.7	91.2	95	151.5	122.7	45	190.4	154.2	95	229.2	185.6
46	35.7	28.9	96	74.6	60.4	146	113.5	91.9	196	152.3	123.3	246	191.2	154.8	296	230.0	186.3
47	36.5	29.6	97	75.4	61.9	47	114.2	92.5	97	153.1	124.0	47	191.9	155.4	97	230.8	186.9
48	37.3	30.2	98	76.2	61.7	48	115.0	93.1	98	153.9	124.6	48	192.7	156.1	98	231.6	187.5
49	38.1	30.8	99	76.9	62.3	49	115.8	93.8	99	154.6	125.2	49	193.5	156.7	99	232.4	188.2
50	38.9	31.5	100	77.7	62.9	150	116.6	94.4	200	155.4	125.9	250	194.3	157.3	300	233.1	188.8
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 51 Deg.



Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep
1	00.8	00.6	51	39.1	32.8	101	77.4	64.9	151	115.7	97.1	201	154.0	129.2	251	192.3	161.4
2	01.5	01.3	52	39.8	33.4	02	78.1	65.6	52	116.4	97.7	02	154.7	129.9	52	193.0	162.0
3	02.3	01.9	53	40.6	34.1	03	78.9	66.2	53	117.2	98.4	03	155.5	130.5	53	193.8	162.6
4	03.1	02.6	54	41.4	34.7	04	79.7	66.8	54	118.0	99.0	04	156.3	131.1	54	194.6	163.3
5	03.8	03.2	55	42.1	35.3	05	80.4	67.5	55	118.7	99.6	05	157.0	131.8	55	195.3	163.9
6	04.6	03.9	56	42.9	36.0	106	81.2	68.1	156	119.5	100.3	206	157.8	132.4	256	196.1	164.6
7	05.4	04.5	57	43.7	36.6	07	82.0	68.8	57	120.3	100.9	07	158.6	133.1	57	196.9	165.2
8	06.1	05.1	58	44.4	37.3	08	82.7	69.4	58	121.0	101.6	08	159.3	133.7	58	197.6	165.9
9	06.9	05.8	59	45.2	37.9	09	83.5	70.1	59	121.8	102.2	09	160.1	134.4	59	198.4	166.5
10	07.7	06.4	60	46.0	38.6	10	84.3	70.7	60	122.6	102.8	10	160.9	135.0	60	199.2	167.1
11	08.4	07.1	61	46.7	39.2	111	85.0	71.3	161	123.3	103.5	211	161.6	135.6	261	199.9	167.8
12	09.2	07.7	62	47.5	39.9	12	85.8	72.0	62	124.1	104.1	12	162.4	136.3	62	200.7	168.4
13	10.0	08.4	63	48.3	40.5	13	86.6	72.6	63	124.9	104.8	13	163.2	136.9	63	201.4	169.1
14	10.7	09.0	64	49.0	41.1	14	87.3	73.3	64	125.6	105.4	14	163.9	137.6	64	202.2	169.7
15	11.5	09.6	65	49.8	41.8	15	88.1	73.9	65	126.4	106.1	15	164.7	138.2	65	203.0	170.4
16	12.3	10.3	66	50.6	42.4	116	88.9	74.6	166	127.2	106.7	216	165.4	138.8	266	203.7	171.0
17	13.0	10.9	67	51.3	43.1	17	89.6	75.2	67	127.9	107.3	17	166.2	139.5	67	204.5	171.6
18	13.8	11.6	68	52.1	43.7	18	90.4	75.9	68	128.7	108.0	18	167.0	140.1	68	205.3	172.3
19	14.6	12.2	69	52.9	44.4	19	91.2	76.5	69	129.4	108.6	19	167.7	140.8	69	206.0	172.9
20	15.3	12.9	70	53.6	45.0	20	91.9	77.1	70	130.2	109.3	20	168.5	141.4	70	206.8	173.6
21	16.1	13.5	71	54.4	45.6	121	92.7	77.8	171	131.0	109.9	221	169.3	142.1	271	207.6	174.2
22	16.9	14.1	72	55.2	46.3	22	93.4	78.4	72	131.7	110.6	22	170.0	142.7	72	208.3	174.8
23	17.6	14.8	73	55.9	46.9	23	94.2	79.1	73	132.5	111.2	23	170.8	143.3	73	209.1	175.5
24	18.4	15.4	74	56.7	47.6	24	95.0	79.7	74	133.3	111.9	24	171.6	144.0	74	209.9	176.1
25	19.2	16.1	75	57.4	48.2	25	95.7	80.4	75	134.0	112.5	25	172.3	144.6	75	210.6	176.8
26	19.9	16.7	76	58.2	48.9	126	96.5	81.0	176	134.8	113.1	226	173.1	145.3	276	211.4	177.4
27	20.7	17.4	77	59.0	49.5	27	97.3	81.6	77	135.6	113.8	27	173.9	145.9	77	212.2	178.1
28	21.4	18.0	78	59.7	50.1	28	98.0	82.3	78	136.3	114.4	28	174.6	146.6	78	212.9	178.7
29	22.2	18.6	79	60.5	50.8	29	98.8	82.9	79	137.1	115.1	29	175.4	147.2	79	213.7	179.3
30	23.0	19.3	80	61.3	51.4	30	99.6	83.6	80	137.9	115.7	30	176.2	147.9	80	214.5	180.0
31	23.7	19.9	81	62.0	52.1	131	100.3	84.2	181	138.6	116.4	231	176.9	148.5	281	215.2	180.6
32	24.5	20.6	82	62.8	52.7	32	101.1	84.9	82	139.4	117.0	32	177.7	149.1	82	216.0	181.3
33	25.3	21.2	83	63.6	53.4	33	101.9	85.5	83	140.2	117.6	33	178.5	149.8	83	216.8	181.9
34	26.0	21.9	84	64.3	54.0	34	102.6	86.1	84	140.9	118.3	34	179.2	150.4	84	217.5	182.6
35	26.8	22.5	85	65.1	54.6	35	103.4	86.8	85	141.7	118.9	35	180.0	151.1	85	218.3	183.2
36	27.6	23.1	86	65.9	55.3	136	104.2	87.4	186	142.5	119.6	236	180.8	151.7	286	219.1	183.9
37	28.3	23.8	87	66.6	55.9	37	104.9	88.1	87	143.2	120.2	37	181.5	152.4	87	219.8	184.5
38	29.1	24.4	88	67.4	56.6	38	105.7	88.7	88	144.0	120.9	38	182.3	153.0	88	220.6	185.1
39	29.9	25.1	89	68.2	57.2	39	106.5	89.4	89	144.8	121.5	39	183.1	153.6	89	221.4	185.8
40	30.6	25.7	90	68.9	57.9	40	107.2	90.0	90	145.5	122.1	40	183.8	154.3	90	222.1	186.4
41	31.4	26.4	91	69.7	58.5	141	108.0	90.6	191	146.3	122.8	241	184.6	154.9	291	222.9	187.1
42	32.2	27.0	92	70.5	59.1	42	108.8	91.3	92	147.1	123.4	42	185.4	155.6	92	223.7	187.7
43	32.9	27.6	93	71.2	59.8	43	109.5	91.9	93	147.8	124.1	43	186.1	156.2	93	224.4	188.4
44	33.7	28.3	94	72.0	60.4	44	110.3	92.6	94	148.6	124.7	44	186.9	156.9	94	225.2	189.0
45	34.5	28.9	95	72.8	61.1	45	111.1	93.2	95	149.4	125.4	45	187.7	157.5	95	226.0	189.6
46	35.2	29.6	96	73.5	61.7	146	111.8	93.9	196	150.1	126.0	246	188.4	158.1	296	226.7	190.3
47	36.0	30.2	97	74.3	62.4	47	112.6	94.5	97	150.9	126.6	47	189.2	158.8	97	227.5	190.9
48	36.8	30.8	98	75.1	63.0	48	113.4	95.1	98	151.7	127.3	48	190.0	159.4	98	228.3	191.6
49	37.5	31.5	99	75.8	63.6	49	114.1	95.8	99	152.4	127.9	49	190.7	160.1	99	229.0	192.2
50	38.3	32.1	100	76.6	64.3	150	114.9	96.4	200	153.2	128.6	250	191.5	160.7	300	229.8	192.9
Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat

for 50 Deg.

# Difference of Latitude and Departure for 41 Deg.

41

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.8	00.7	51	38.5	33.5	101	76.2	66.3	151	114.0	99.0	201	151.7	131.8	251	189.4	164.6
2	01.5	01.3	52	39.2	34.1	02	77.0	66.9	52	114.7	99.7	02	152.5	132.5	52	190.2	165.3
3	02.3	02.0	53	40.0	34.8	03	77.7	67.6	53	115.5	100.4	03	153.2	133.2	53	190.9	166.0
4	03.0	02.6	54	40.8	35.4	04	78.5	68.2	54	116.2	101.0	04	154.0	133.8	54	191.7	166.6
5	03.8	03.3	55	41.5	36.1	05	79.2	68.9	55	117.0	101.7	05	154.7	134.5	55	192.5	167.3
6	04.5	03.9	56	42.3	36.7	106	80.0	69.5	156	117.7	102.3	206	155.5	135.1	256	193.2	167.9
7	05.3	04.6	57	43.0	37.4	07	80.8	70.2	57	118.5	103.0	07	156.2	135.8	57	194.0	168.6
8	06.0	05.2	58	43.8	38.0	08	81.5	70.8	58	119.2	103.6	08	157.0	136.4	58	194.7	169.2
9	06.8	05.9	59	44.5	38.7	09	82.3	71.5	59	120.0	104.3	09	157.7	137.1	59	195.5	169.9
10	07.5	06.6	60	45.3	39.4	10	83.0	72.2	60	120.8	105.0	10	158.5	137.7	60	196.2	170.5
11	08.3	07.2	61	46.0	40.0	111	83.8	72.8	161	121.5	105.6	211	159.2	138.4	261	197.0	171.2
12	09.1	07.9	62	46.8	40.7	12	84.5	73.5	62	122.3	106.3	12	160.0	139.1	62	197.7	171.9
13	09.8	08.5	63	47.5	41.3	13	85.3	74.1	63	123.0	106.9	13	160.8	139.7	63	198.5	172.5
14	10.6	09.2	64	48.3	42.0	14	86.0	74.8	64	123.8	107.6	14	161.5	140.4	64	199.2	173.2
15	11.3	09.8	65	49.1	42.6	15	86.8	75.4	65	124.5	108.2	15	162.3	141.0	65	200.0	173.8
16	12.1	10.5	66	49.8	43.3	116	87.5	76.1	166	125.3	108.9	216	163.0	141.7	266	200.8	174.5
17	12.8	11.2	67	50.6	44.0	17	88.3	76.7	67	126.0	109.5	17	163.8	142.3	67	201.5	175.1
18	13.6	11.8	68	51.3	44.6	18	89.1	77.4	68	126.8	110.2	18	164.5	143.0	68	202.3	175.8
19	14.3	12.5	69	52.1	45.3	19	89.8	78.1	69	127.5	110.9	19	165.3	143.6	69	203.0	176.4
20	15.1	13.1	70	52.8	45.9	20	90.6	78.7	70	128.3	111.5	20	166.0	144.3	70	203.8	177.1
21	15.8	13.8	71	53.6	46.6	121	91.3	79.4	171	129.1	112.2	221	166.8	145.0	271	204.5	177.8
22	16.6	14.4	72	54.3	47.2	22	92.1	80.0	72	129.8	112.8	22	167.5	145.6	72	205.3	178.4
23	17.4	15.1	73	55.1	47.9	23	92.8	80.7	73	130.6	113.5	23	168.3	146.3	73	206.0	179.1
24	18.1	15.7	74	55.8	48.5	24	93.6	81.3	74	131.3	114.1	24	169.1	146.9	74	206.8	179.7
25	18.9	16.4	75	56.6	49.2	25	94.3	82.0	75	132.1	114.8	25	169.8	147.6	75	207.5	180.4
26	19.6	17.1	76	57.4	49.9	126	95.1	82.6	176	132.8	115.4	226	170.6	148.2	276	208.3	181.0
27	20.4	17.7	77	58.1	50.5	27	95.8	83.3	77	133.6	116.1	27	171.3	148.9	77	209.1	181.7
28	21.1	18.4	78	58.9	51.2	28	96.6	84.0	78	134.3	116.8	28	172.1	149.6	78	209.8	182.4
29	21.9	19.0	79	59.6	51.8	29	97.4	84.6	79	135.1	117.4	29	172.8	150.2	79	210.6	183.0
30	22.6	19.7	80	60.4	52.5	30	98.1	85.3	80	135.8	118.1	30	173.6	150.9	80	211.3	183.7
31	23.4	20.3	81	61.1	53.1	131	98.8	85.9	181	136.6	118.7	231	174.3	151.5	281	212.1	184.3
32	24.2	21.0	82	61.9	53.8	32	99.6	86.6	82	137.4	119.4	32	175.1	152.2	82	212.8	185.0
33	24.9	21.6	83	62.6	54.4	33	100.4	87.2	83	138.1	120.0	33	175.8	152.8	83	213.6	185.6
34	25.7	22.3	84	63.4	55.1	34	101.1	87.9	84	138.9	120.7	34	176.6	153.5	84	214.3	186.3
35	26.4	23.0	85	64.2	55.8	35	101.9	88.6	85	139.6	121.4	35	177.4	154.1	85	215.1	186.9
36	27.2	23.6	86	64.9	56.4	136	102.6	89.2	186	140.4	122.0	236	178.1	154.8	286	215.8	187.6
37	27.9	24.3	87	65.7	57.1	37	103.4	89.9	87	141.1	122.7	37	178.9	155.5	87	216.6	188.3
38	28.7	24.9	88	66.4	57.7	38	104.2	90.5	88	141.9	123.3	38	179.6	156.1	88	217.4	188.9
39	29.4	25.6	89	67.2	58.4	39	104.9	91.2	89	142.6	124.0	39	180.4	156.8	89	218.1	189.6
40	30.2	26.2	90	67.9	59.0	40	105.7	91.8	90	143.4	124.6	40	181.1	157.4	90	218.9	190.2
41	30.9	26.9	91	68.7	59.7	141	106.4	92.5	191	144.2	125.3	241	181.9	158.1	291	219.6	190.9
42	31.7	27.6	92	69.4	60.4	42	107.2	93.1	92	144.9	125.9	42	182.6	158.7	92	220.4	191.5
43	32.5	28.2	93	70.2	61.0	43	107.9	93.8	93	145.7	126.6	43	183.4	159.4	93	221.1	192.2
44	33.2	28.9	94	70.9	61.7	44	108.7	94.5	94	146.4	127.3	44	184.2	160.0	94	221.9	192.8
45	34.0	29.5	95	71.7	62.3	45	109.4	95.1	95	147.2	127.9	45	184.9	160.7	95	222.6	193.5
46	34.7	30.2	96	72.5	63.0	146	110.2	95.8	196	147.9	128.6	246	185.7	161.4	296	223.4	194.2
47	35.5	30.8	97	73.2	63.6	47	110.9	96.4	97	148.7	129.2	47	186.4	162.0	97	224.2	194.8
48	36.2	31.5	98	74.0	64.3	48	111.7	97.1	98	149.4	129.9	48	187.2	162.7	98	224.9	195.5
49	37.0	32.1	99	74.7	64.9	49	112.5	97.7	99	150.2	130.5	49	187.9	163.3	99	225.7	196.1
50	37.7	32.8	100	75.5	65.6	150	113.2	98.4	200	150.9	131.2	250	188.7	164.0	300	226.4	196.8
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

for 49 Deg.



## Difference of Latitude and Departure for 42 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.7	00.7	51	37.9	34.1	101	75.0	67.6	151	112.2	101.0	201	149.3	134.5	251	186.5	167.9
2	01.5	01.3	52	38.6	34.8	02	75.8	68.2	52	112.9	101.7	02	150.1	135.1	52	187.2	168.6
3	02.2	02.0	53	39.4	35.5	03	76.5	68.9	53	113.7	102.4	03	150.8	135.8	53	187.9	169.3
4	03.0	02.7	54	40.1	36.1	04	77.3	69.6	54	114.4	103.0	04	151.5	136.5	54	188.7	169.9
5	03.7	03.3	55	40.9	36.8	05	78.0	70.2	55	115.1	103.7	05	152.3	137.1	55	189.4	170.6
6	04.5	04.0	56	41.6	37.5	106	78.7	70.9	156	115.9	104.4	206	153.0	137.8	256	190.2	171.3
7	05.2	04.7	57	42.3	38.1	07	79.5	71.6	57	116.6	105.0	07	153.8	138.5	57	190.9	171.9
8	05.9	05.4	58	43.1	38.8	08	80.2	72.3	58	117.4	105.7	08	154.5	139.1	58	191.7	172.6
9	06.7	06.0	59	43.8	39.5	09	81.0	72.9	59	118.1	106.4	09	155.3	139.8	59	192.4	173.3
10	07.4	06.7	60	44.6	40.1	10	81.7	73.6	60	118.9	107.0	10	156.0	140.5	60	193.1	173.9
11	08.2	07.4	61	45.3	40.8	111	82.5	74.3	161	119.6	107.7	211	156.7	141.2	261	193.9	174.6
12	08.9	08.0	62	46.1	41.5	12	83.2	74.9	62	120.3	108.4	12	157.5	141.8	62	194.6	175.3
13	09.7	08.7	63	46.8	42.1	13	83.9	75.6	63	121.1	109.0	13	158.2	142.5	63	195.4	175.9
14	10.4	09.4	64	47.5	42.8	14	84.7	76.3	64	121.8	109.7	14	159.0	143.2	64	196.1	176.6
15	11.1	10.0	65	48.3	43.5	15	85.4	76.9	65	122.6	101.4	15	159.7	143.8	65	196.9	177.3
16	11.9	10.7	66	49.0	44.2	116	86.2	77.6	166	123.3	111.0	216	160.5	144.5	266	197.6	177.9
17	12.6	11.4	67	49.8	44.8	17	86.9	78.3	67	124.1	111.7	17	161.2	145.2	67	198.3	178.6
18	13.4	12.0	68	50.5	45.5	18	87.7	78.9	68	124.8	112.4	18	161.9	145.8	68	199.1	179.3
19	14.1	12.7	69	51.3	46.2	19	88.4	79.6	69	125.5	113.1	19	162.7	146.5	69	199.8	180.0
20	14.9	13.4	70	52.0	46.8	20	89.1	80.3	70	126.3	113.7	20	163.4	147.2	70	200.6	180.6
21	15.6	14.0	71	52.7	47.5	121	89.9	80.9	171	127.0	114.4	221	164.2	147.8	271	201.3	181.3
22	16.3	14.7	72	53.5	48.2	22	90.6	81.6	72	127.8	115.1	22	164.9	148.5	72	202.1	182.0
23	17.1	15.4	73	54.2	48.8	23	91.4	82.3	73	128.5	115.7	23	165.7	149.2	73	202.8	182.6
24	17.8	16.1	74	55.0	49.5	24	92.1	83.0	74	129.3	116.4	24	166.4	149.9	74	203.5	183.3
25	18.6	16.7	75	55.7	50.2	25	92.9	83.6	75	130.0	117.1	25	167.1	150.5	75	204.3	184.0
26	19.3	17.4	76	56.5	50.8	126	93.6	84.3	176	130.7	117.7	226	167.9	151.2	276	205.0	184.6
27	20.1	18.1	77	57.2	51.5	27	94.3	85.0	77	131.5	118.4	27	168.6	151.9	77	205.8	185.3
28	20.8	18.7	78	57.9	52.2	28	95.1	85.6	78	132.2	119.1	28	169.4	152.5	78	206.5	186.0
29	21.5	19.4	79	58.7	52.9	29	95.8	86.3	79	133.0	119.7	29	170.1	153.2	79	207.3	186.6
30	22.3	20.1	80	59.4	53.5	30	96.6	87.0	80	133.7	120.4	30	170.9	153.9	80	208.0	187.3
31	23.0	20.7	81	60.2	54.2	131	97.3	87.6	181	134.5	121.1	231	171.6	154.5	281	208.7	188.0
32	23.8	21.4	82	60.9	54.9	32	98.1	88.3	82	135.2	121.8	32	172.3	155.2	82	209.5	188.7
33	24.5	22.1	83	61.7	55.5	33	98.8	89.0	83	135.9	122.4	33	173.1	155.9	83	210.2	189.3
34	25.3	22.7	84	62.4	56.2	34	99.5	89.6	84	136.7	123.1	34	173.8	156.5	84	211.0	190.0
35	26.0	23.4	85	63.1	56.9	35	100.3	90.3	85	137.4	123.8	35	174.6	157.2	85	211.7	190.7
36	26.7	24.1	86	63.9	57.5	136	101.0	91.0	186	138.2	124.4	236	175.3	157.9	286	212.5	191.3
37	27.5	24.8	87	64.6	58.2	37	101.8	91.7	87	138.9	125.1	37	176.1	158.5	87	213.2	192.0
38	28.2	25.4	88	65.4	58.9	38	102.5	92.3	88	139.7	125.8	38	176.8	159.2	88	213.9	192.7
39	29.0	26.1	89	66.1	59.5	39	103.3	93.0	89	140.4	126.4	39	177.5	159.9	89	214.7	193.3
40	29.7	26.8	90	66.9	60.2	40	104.0	93.7	90	141.1	127.1	40	178.3	160.6	90	215.4	194.0
41	30.5	27.4	91	67.6	60.9	141	104.7	94.3	191	141.9	127.8	241	179.0	161.2	291	216.2	194.7
42	31.2	28.1	92	68.3	61.5	42	105.5	95.0	92	142.6	128.4	42	179.8	161.9	92	216.9	195.3
43	31.9	28.8	93	69.1	62.2	43	106.2	95.7	93	143.4	129.1	43	180.5	162.6	93	217.7	196.0
44	32.7	29.4	94	69.8	62.9	44	107.0	96.3	94	144.1	129.8	44	181.3	163.2	94	218.4	196.7
45	33.4	30.1	95	70.6	63.6	45	107.7	97.0	95	144.9	130.5	45	182.0	163.9	95	219.1	197.4
46	34.2	30.8	96	71.3	64.2	146	108.5	97.7	196	145.6	131.1	246	182.7	164.6	296	219.9	198.0
47	34.9	31.4	97	72.1	64.9	47	109.2	98.3	97	146.3	131.8	47	183.5	165.2	97	220.6	198.7
48	35.7	32.1	98	72.8	65.6	48	109.9	99.0	98	147.1	132.5	48	184.2	165.9	98	221.4	199.4
49	36.4	32.8	99	73.5	66.2	49	110.7	99.7	99	147.8	133.1	49	185.0	166.6	99	222.1	200.0
50	37.1	33.5	100	74.3	66.9	150	111.4	100.4	200	148.6	133.8	250	185.7	167.2	300	222.9	200.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 48 Deg.

# Difference of Latitude and Departure for 43 Deg.

43

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.7	00.7	51	37.3	34.8	101	73.9	68.9	151	110.4	103.0	201	147.0	137.1	251	183.6	171.2
2	01.5	01.4	52	38.0	35.5	102	74.6	69.5	52	111.2	103.6	02	147.7	137.7	52	184.3	171.8
3	02.2	02.0	53	38.8	36.2	103	75.3	70.2	53	111.9	104.3	03	148.5	138.4	53	185.0	172.5
4	02.9	02.7	54	39.5	36.8	104	76.1	70.9	54	112.6	105.0	04	149.2	139.1	54	185.8	173.2
5	03.7	03.4	55	40.2	37.5	105	76.8	71.6	55	113.4	105.7	05	149.9	139.8	55	186.5	173.9
6	04.4	04.1	56	41.0	38.2	106	77.5	72.3	156	114.1	106.4	206	150.7	140.5	256	187.2	174.5
7	05.1	04.8	57	41.7	38.9	107	78.3	73.0	57	114.8	107.1	07	151.4	141.2	57	187.9	175.2
8	05.9	05.5	58	42.4	39.5	108	79.0	73.6	58	115.6	107.7	08	152.1	141.8	58	188.7	175.9
9	06.6	06.2	59	43.1	40.2	109	79.7	74.3	59	116.3	108.4	09	152.9	142.5	59	189.4	176.6
10	07.3	06.8	60	43.9	40.9	110	80.4	75.0	60	117.0	109.1	10	153.6	143.2	60	190.1	177.3
11	08.0	07.5	61	44.6	41.6	111	81.2	75.7	161	117.7	109.8	211	154.3	143.9	261	190.9	178.0
12	08.8	08.2	62	45.3	42.3	112	81.9	76.4	62	118.5	110.5	12	155.0	144.5	62	191.6	178.6
13	09.5	08.9	63	46.1	43.0	113	82.6	77.1	63	119.2	111.2	13	155.8	145.2	63	192.3	179.3
14	10.2	09.5	64	46.8	43.6	114	83.4	77.7	64	119.9	111.8	14	156.5	145.9	64	193.1	180.0
15	11.0	10.2	65	47.5	44.3	115	84.1	78.4	65	120.7	112.5	15	157.2	146.6	65	193.8	180.7
16	11.7	10.9	66	48.3	45.0	116	84.8	79.1	166	121.4	113.2	216	158.0	147.3	266	194.5	181.4
17	12.4	11.6	67	49.0	45.7	117	85.6	79.8	67	122.1	113.9	17	158.7	148.0	67	195.3	182.1
18	13.2	12.3	68	49.7	46.4	118	86.3	80.5	68	122.9	114.5	18	159.4	148.6	68	196.0	182.7
19	13.9	13.0	69	50.5	47.1	119	87.0	81.2	69	123.6	115.2	19	160.2	149.3	69	196.7	183.4
20	14.6	13.6	70	51.2	47.7	120	87.8	81.8	70	124.3	115.9	20	160.9	150.0	70	197.5	184.1
21	15.4	14.3	71	51.9	48.4	121	88.5	82.5	171	125.1	116.6	221	161.6	150.7	271	198.2	184.8
22	16.1	15.0	72	52.7	49.1	122	89.2	83.2	72	125.8	117.3	22	162.4	151.4	72	198.9	185.5
23	16.8	15.7	73	53.4	49.8	123	90.0	83.9	73	126.5	118.0	23	163.1	152.1	73	199.7	186.2
24	17.6	16.4	74	54.1	50.5	124	90.7	84.5	74	127.3	118.6	24	163.8	152.7	74	200.4	186.8
25	18.3	17.1	75	54.9	51.2	125	91.4	85.2	75	128.0	119.3	25	164.6	153.4	75	201.1	187.5
26	19.0	17.7	76	55.6	51.8	126	92.1	85.9	176	128.7	120.0	226	165.3	154.1	276	201.9	188.2
27	19.7	18.4	77	56.3	52.5	127	92.9	86.6	77	129.4	120.7	27	166.0	154.8	77	202.6	188.9
28	20.5	19.1	78	57.0	53.2	128	93.6	87.3	78	130.2	121.4	28	166.7	155.5	78	203.3	189.5
29	21.2	19.8	79	57.8	53.9	129	94.3	88.0	79	130.9	122.1	29	167.5	156.2	79	204.0	190.2
30	21.9	20.5	80	58.5	54.5	130	95.1	88.6	80	131.6	122.7	30	168.2	156.8	80	204.8	190.9
31	22.7	21.2	81	59.2	55.2	131	95.8	89.3	181	132.4	123.4	231	168.9	157.5	281	205.5	191.6
32	23.4	21.8	82	60.0	55.9	132	96.5	90.0	82	133.1	124.1	32	169.7	158.2	82	206.2	192.3
33	24.1	22.5	83	60.7	56.6	133	97.3	90.7	83	133.8	124.8	33	170.4	158.9	83	207.0	193.0
34	24.9	23.2	84	61.4	57.3	134	98.0	91.4	84	134.6	125.5	34	171.1	159.5	84	207.7	193.6
35	25.6	23.9	85	62.2	58.0	135	98.7	92.1	85	135.3	126.2	35	171.9	160.2	85	208.4	194.3
36	26.3	24.5	86	62.9	58.6	136	99.5	92.7	186	136.0	126.8	236	172.6	160.9	286	209.2	195.0
37	27.1	25.2	87	63.6	59.3	137	100.2	93.4	87	136.8	127.5	37	173.3	161.6	87	209.9	195.7
38	27.8	25.9	88	64.4	60.0	138	100.9	94.1	88	137.5	128.2	38	174.1	162.3	88	210.6	196.4
39	28.5	26.6	89	65.1	60.7	139	101.7	94.8	89	138.2	128.9	39	174.8	163.0	89	211.4	197.1
40	29.3	27.3	90	65.8	61.4	140	102.4	95.5	90	139.0	129.5	40	175.5	163.6	90	212.1	197.7
41	30.0	28.0	91	66.6	62.1	141	103.1	96.2	191	139.7	130.2	241	176.3	164.3	291	212.8	198.4
42	30.7	28.6	92	67.3	62.7	142	103.9	96.8	92	140.4	130.9	42	177.0	165.0	92	213.6	199.1
43	31.4	29.3	93	68.0	63.4	143	104.6	97.5	93	141.1	131.6	43	177.7	165.7	93	214.3	199.8
44	32.2	30.0	94	68.7	64.1	144	105.3	98.2	94	141.9	132.3	44	178.4	166.4	94	215.0	200.5
45	32.9	30.7	95	69.5	64.8	145	106.0	98.9	95	142.6	133.0	45	179.2	167.1	95	215.7	201.2
46	33.6	31.4	96	70.2	65.5	146	106.8	99.5	196	143.3	133.6	246	179.9	167.7	296	216.5	201.8
47	34.4	32.1	97	70.9	66.2	147	107.5	100.2	97	144.1	134.3	47	180.6	168.4	97	217.2	202.5
48	35.1	32.7	98	71.7	66.8	148	108.2	100.9	98	144.8	135.0	48	181.4	169.1	98	218.0	203.2
49	35.8	33.4	99	72.4	67.5	149	109.0	101.6	99	145.5	135.7	49	182.1	169.8	99	218.7	203.9
50	36.6	34.1	100	73.1	68.2	150	109.7	102.3	200	146.3	136.4	250	182.8	170.5	300	219.4	204.6
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 47 Deg.



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.7	00.7	51	36.7	35.4	101	72.6	70.2	151	108.6	104.9	201	144.6	139.6	251	180.5	174.3
2	01.4	01.4	52	37.4	36.1	02	73.4	70.8	52	109.3	105.6	02	145.3	140.3	52	181.3	175.0
3	02.2	02.1	53	38.1	36.8	03	74.1	71.5	53	110.1	106.3	03	146.0	141.0	53	182.0	175.7
4	02.9	02.8	54	38.8	37.5	04	74.8	72.2	54	110.8	107.0	04	146.7	141.7	54	182.7	176.4
5	03.6	03.5	55	39.6	38.2	05	75.5	72.9	55	111.5	107.7	05	147.5	142.4	55	183.4	177.1
6	04.3	04.2	56	40.3	38.9	106	76.2	73.6	156	112.2	108.4	206	148.2	143.1	256	184.1	177.8
7	05.0	04.9	57	41.0	39.6	07	77.0	74.3	57	112.9	109.1	07	148.9	143.8	57	184.9	178.5
8	05.8	05.6	58	41.7	40.3	08	77.7	75.0	58	113.6	109.7	08	149.6	144.5	58	185.6	179.2
9	06.5	06.3	59	42.4	41.0	09	78.4	75.7	59	114.4	110.4	09	150.3	145.2	59	186.3	179.9
10	07.2	06.9	60	43.2	41.7	10	79.1	76.4	60	115.1	111.1	10	151.1	145.9	60	187.0	180.6
11	07.9	07.6	61	43.9	42.4	111	79.8	77.1	161	115.8	111.8	211	151.8	146.6	261	187.7	181.3
12	08.6	08.3	62	44.6	43.1	12	80.6	77.8	62	116.5	112.5	12	152.5	147.3	62	188.5	182.0
13	09.4	09.0	63	45.3	43.8	13	81.3	78.5	63	117.2	113.2	13	153.2	147.9	63	189.2	182.7
14	10.1	09.7	64	46.0	44.5	14	82.0	79.2	64	118.0	113.9	14	153.9	148.6	64	189.9	183.4
15	10.8	10.4	65	46.8	45.1	15	82.7	79.9	65	118.7	114.6	15	154.6	149.3	65	190.6	184.1
16	11.5	11.1	66	47.5	45.8	116	83.4	80.6	166	119.4	115.3	216	155.4	150.0	266	191.3	184.8
17	12.2	11.8	67	48.2	46.5	17	84.2	81.3	67	120.1	116.0	17	156.1	150.7	67	192.1	185.5
18	12.9	12.5	68	48.9	47.2	18	84.9	82.0	68	120.8	116.7	18	156.8	151.4	68	192.8	186.1
19	13.7	13.2	69	49.6	47.9	19	85.6	82.7	69	121.6	117.4	19	157.5	152.1	69	193.5	186.8
20	14.4	13.9	70	50.4	48.6	20	86.3	83.4	70	122.3	118.1	20	158.2	152.8	70	194.2	187.5
21	15.1	14.6	71	51.1	49.3	121	87.0	84.0	171	123.0	118.8	221	159.0	153.5	271	194.9	188.2
22	15.8	15.3	72	51.8	50.0	22	87.8	84.7	72	123.7	119.5	22	159.7	154.2	72	195.6	188.9
23	16.5	16.0	73	52.5	50.7	23	88.5	85.4	73	124.4	120.2	23	160.4	154.9	73	196.4	189.6
24	17.3	16.7	74	53.2	51.4	24	89.2	86.1	74	125.2	120.9	24	161.1	155.6	74	197.1	190.3
25	18.0	17.4	75	53.9	52.1	25	89.9	86.8	75	125.9	121.6	25	161.8	156.3	75	197.8	191.0
26	18.7	18.1	76	54.7	52.8	126	90.6	87.5	176	126.6	122.2	226	162.6	157.0	276	198.5	191.7
27	19.4	18.8	77	55.4	53.5	27	91.4	88.2	77	127.3	122.9	27	163.3	157.7	77	199.2	192.4
28	20.1	19.4	78	56.1	54.2	28	92.1	88.9	78	128.0	123.6	28	164.0	158.4	78	200.0	193.1
29	20.9	20.1	79	56.8	54.9	29	92.8	89.6	79	128.8	124.3	29	164.7	159.1	79	200.7	193.8
30	21.6	20.8	80	57.5	55.6	30	93.5	90.3	80	129.5	125.0	30	165.4	159.8	80	201.4	194.5
31	22.3	21.5	81	58.3	56.3	131	94.2	91.0	181	130.2	125.7	231	166.2	160.4	281	202.1	195.2
32	23.0	22.2	82	59.0	57.0	32	94.9	91.7	82	130.9	126.4	32	166.9	161.1	82	202.8	195.9
33	23.7	22.9	83	59.7	57.7	33	95.7	92.4	83	131.6	127.1	33	167.6	161.8	83	203.6	196.6
34	24.5	23.6	84	60.4	58.3	34	96.4	93.1	84	132.4	127.8	34	168.3	162.5	84	204.3	197.3
35	25.2	24.3	85	61.1	59.0	35	97.1	93.8	85	133.1	128.5	35	169.0	163.2	85	205.0	198.0
36	25.9	25.0	86	61.9	59.7	136	97.8	94.5	186	133.8	129.2	236	169.8	163.9	286	205.7	198.7
37	26.6	25.7	87	62.6	60.4	37	98.5	95.2	87	134.5	129.9	37	170.5	164.6	87	206.4	199.3
38	27.3	26.4	88	63.3	61.1	38	99.3	95.9	88	135.2	130.6	38	171.2	165.3	88	207.2	200.0
39	28.1	27.1	89	64.0	61.8	39	100.0	96.5	89	135.9	131.3	39	171.9	166.0	89	207.9	200.7
40	28.8	27.8	90	64.7	62.5	40	100.7	97.2	90	136.7	132.0	40	172.6	166.7	90	208.6	201.4
41	29.5	28.5	91	65.5	63.2	141	101.4	97.9	191	137.4	132.7	241	173.4	167.4	291	209.3	202.1
42	30.2	29.2	92	66.2	63.9	42	102.1	98.6	92	138.1	133.4	42	174.1	168.1	92	210.0	202.8
43	30.9	29.9	93	66.9	64.6	43	102.9	99.3	93	138.8	134.1	43	174.8	168.8	93	210.8	203.5
44	31.6	30.6	94	67.6	65.3	44	103.6	100.0	94	139.5	134.8	44	175.5	169.5	94	211.5	204.2
45	32.4	31.3	95	68.3	66.0	45	104.3	100.7	95	140.3	135.4	45	176.2	170.2	95	212.2	204.9
46	33.1	32.0	96	69.1	66.7	146	105.0	101.4	196	141.0	136.1	246	176.9	170.9	296	212.9	205.6
47	33.8	32.6	97	69.8	67.4	47	105.7	102.1	97	141.7	136.8	47	177.7	171.6	97	213.6	206.3
48	34.5	33.3	98	70.5	68.1	48	106.5	102.8	98	142.4	137.5	48	178.4	172.3	98	214.4	207.0
49	35.2	34.0	99	71.2	68.8	49	107.2	103.5	99	143.1	138.2	49	179.1	173.0	99	215.1	207.7
50	36.0	34.7	100	71.9	69.5	150	107.9	104.2	200	143.9	138.9	250	179.8	173.6	300	215.8	208.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 46 Deg.

# Difference of Latitude and Departure for 45 Deg.

45

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.7	00.7	51	36.1	36.1	101	71.4	71.4	151	106.8	106.8	201	142.1	142.1	251	177.5	177.5
2	01.4	01.4	52	36.8	36.8	02	72.1	72.1	52	107.5	107.5	02	142.8	142.8	52	178.2	178.2
3	02.1	02.1	53	37.5	37.5	03	72.8	72.8	53	108.2	108.2	03	143.5	143.5	53	178.9	178.9
4	02.8	02.8	54	38.2	38.2	04	73.5	73.5	54	108.9	108.9	04	144.2	144.2	54	179.6	179.6
5	03.5	03.5	55	38.9	38.9	05	74.2	74.2	55	109.6	109.6	05	144.9	144.9	55	180.3	180.3
6	04.2	04.2	56	39.6	39.6	106	74.9	74.9	156	110.3	110.3	206	145.7	145.7	256	181.0	181.0
7	04.9	04.9	57	40.3	40.3	07	75.7	75.7	57	111.0	111.0	07	146.4	146.4	57	181.7	181.7
8	05.7	05.7	58	41.0	41.0	08	76.4	76.4	58	111.7	111.7	08	147.1	147.1	58	182.4	182.4
9	06.4	06.4	59	41.7	41.7	09	77.1	77.1	59	112.4	112.4	09	147.8	147.8	59	183.1	183.1
10	07.1	07.1	60	42.4	42.4	10	77.8	77.8	60	113.1	113.1	10	148.5	148.5	60	183.8	183.8
11	07.8	07.8	61	43.1	43.1	111	78.5	78.5	161	113.8	113.8	211	149.2	149.2	261	184.5	184.5
12	08.5	08.5	62	43.8	43.8	12	79.2	79.2	62	114.5	114.5	12	149.9	149.9	62	185.3	185.3
13	09.2	09.2	63	44.5	44.5	13	79.9	79.9	63	115.3	115.3	13	150.6	150.6	63	186.0	186.0
14	09.9	09.9	64	45.3	45.3	14	80.6	80.6	64	116.0	116.0	14	151.3	151.3	64	186.7	186.7
15	10.6	10.6	65	46.0	46.0	15	81.3	81.3	65	116.7	116.7	15	152.0	152.0	65	187.4	187.4
16	11.3	11.3	66	46.7	46.7	116	82.0	82.0	166	117.4	117.4	216	152.7	152.7	266	188.1	188.1
17	12.0	12.0	67	47.4	47.4	17	82.7	82.7	67	118.1	118.1	17	153.4	153.4	67	188.8	188.8
18	12.7	12.7	68	48.1	48.1	18	83.4	83.4	68	118.8	118.8	18	154.1	154.1	68	189.5	189.5
19	13.4	13.4	69	48.8	48.8	19	84.1	84.1	69	119.5	119.5	19	154.8	154.8	69	190.2	190.2
20	14.1	14.1	70	49.5	49.5	20	84.8	84.8	70	120.2	120.2	20	155.6	155.6	70	190.9	190.9
21	14.8	14.8	71	50.2	50.2	121	85.6	85.6	171	120.9	120.9	221	156.3	156.3	271	191.6	191.6
22	15.6	15.6	72	50.9	50.9	22	86.3	86.3	72	121.6	121.6	22	157.0	157.0	72	192.3	192.3
23	16.3	16.3	73	51.6	51.6	23	87.0	87.0	73	122.3	122.3	23	157.7	157.7	73	193.0	193.0
24	17.0	17.0	74	52.3	52.3	24	87.7	87.7	74	123.0	123.0	24	158.4	158.4	74	193.7	193.7
25	17.7	17.7	75	53.0	53.0	25	88.4	88.4	75	123.7	123.7	25	159.1	159.1	75	194.4	194.4
26	18.4	18.4	76	53.7	53.7	126	89.1	89.1	176	124.4	124.4	226	159.8	159.8	276	195.2	195.2
27	19.1	19.1	77	54.4	54.4	27	89.8	89.8	77	125.2	125.2	27	160.5	160.5	77	195.9	195.9
28	19.8	19.8	78	55.2	55.2	28	90.5	90.5	78	125.9	125.9	28	161.2	161.2	78	196.6	196.6
29	20.5	20.5	79	55.9	55.9	29	91.2	91.2	79	126.6	126.6	29	161.9	161.9	79	197.3	197.3
30	21.2	21.2	80	56.6	56.6	30	91.9	91.9	80	127.3	127.3	30	162.6	162.6	80	198.0	198.0
31	21.9	21.9	81	57.3	57.3	131	92.6	92.6	181	128.0	128.0	231	163.3	163.3	281	198.7	198.7
32	22.6	22.6	82	58.0	58.0	32	93.3	93.3	82	128.7	128.7	32	164.0	164.0	82	199.4	199.4
33	23.3	23.3	83	58.7	58.7	33	94.0	94.0	83	129.4	129.4	33	164.7	164.7	83	200.1	200.1
34	24.0	24.0	84	59.4	59.4	34	94.7	94.7	84	130.1	130.1	34	165.5	165.5	84	200.8	200.8
35	24.7	24.7	85	60.1	60.1	35	95.5	95.5	85	130.8	130.8	35	166.2	166.2	85	201.5	201.5
36	25.5	25.5	86	60.8	60.8	136	96.2	96.2	186	131.5	131.5	236	166.9	166.9	286	202.2	202.2
37	26.2	26.2	87	61.5	61.5	37	96.9	96.9	87	132.2	132.2	37	167.6	167.6	87	202.9	202.9
38	26.9	26.9	88	62.2	62.2	38	97.6	97.6	88	132.9	132.9	38	168.3	168.3	88	203.6	203.6
39	27.6	27.6	89	62.9	62.9	39	98.3	98.3	89	133.6	133.6	39	169.0	169.0	89	204.3	204.3
40	28.3	28.3	90	63.6	63.6	40	99.0	99.0	90	134.3	134.3	40	169.7	169.7	90	205.1	205.1
41	29.0	29.0	91	64.3	64.3	141	99.7	99.7	191	135.1	135.1	241	170.4	170.4	291	205.8	205.8
42	29.7	29.7	92	65.1	65.1	42	100.4	100.4	92	135.8	135.8	42	171.1	171.1	92	206.5	206.5
43	30.4	30.4	93	65.8	65.8	43	101.1	101.1	93	136.5	136.5	43	171.8	171.8	93	207.2	207.2
44	31.1	31.1	94	66.5	66.5	44	101.8	101.8	94	137.2	137.2	44	172.5	172.5	94	207.9	207.9
45	31.8	31.8	95	67.2	67.2	45	102.5	102.5	95	137.9	137.9	45	173.2	173.2	95	208.6	208.6
46	32.5	32.5	96	67.9	67.9	146	103.2	103.2	196	138.6	138.6	246	173.9	173.9	296	209.3	209.3
47	33.2	33.2	97	68.6	68.6	47	103.9	103.9	97	139.3	139.3	47	174.6	174.6	97	210.0	210.0
48	33.9	33.9	98	69.3	69.3	48	104.6	104.6	98	140.0	140.0	48	175.4	175.4	98	210.7	210.7
49	34.6	34.6	99	70.0	70.0	49	105.4	105.4	99	140.7	140.7	49	176.1	176.1	99	211.4	211.4
50	35.4	35.4	100	70.7	70.7	150	106.1	106.1	200	141.4	141.4	250	176.8	176.8	300	212.1	212.1
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

for 45 Deg.



*Numbers for the Reader finding the Course in the foregoing Tables of Difference of Latitude and Departure,*

Dist. and Diff. of Lat.				Dist. and Departure.				Diff. of Lat. and Dep.			
Num	Deg.	Num	Deg.	Num	Deg.	Num	Deg.	Num	Deg.	Num	Deg.
1000	1	17	89	17	1	1000	89	2	1	5882	89
999	2	35	88	35	2	999	88	3	2	2855	88
998	3	52	87	52	3	998	87	5	3	1908	87
997	4	70	86	70	4	997	86	7	4	1432	86
996	5	87	85	87	5	996	85	9	5	1145	85
995	6	105	84	105	6	995	84	10	6	950	84
993	7	122	83	122	7	993	83	12	7	816	83
990	8	139	82	139	8	990	82	14	8	711	82
988	9	156	81	156	9	988	81	16	9	632	81
985	10	173	80	173	10	985	80	18	10	568	80
982	11	191	79	191	11	982	79	19	11	515	79
978	12	208	78	208	12	978	78	21	12	470	78
974	13	225	77	225	13	974	77	23	13	433	77
970	14	242	76	242	14	970	76	25	14	401	76
966	15	259	75	259	15	966	75	27	15	373	75
961	16	276	74	276	16	961	74	29	16	349	74
956	17	292	73	292	17	956	73	30	17	328	73
951	18	309	72	309	18	951	72	32	18	308	72
945	19	326	71	326	19	945	71	34	19	290	71
940	20	342	70	342	20	940	70	36	20	275	70
934	21	358	69	358	21	934	69	38	21	260	69
927	22	375	68	375	22	927	68	40	22	248	68
921	23	391	67	391	23	921	67	42	23	236	67
914	24	407	66	407	24	914	66	45	24	225	66
906	25	423	65	423	25	906	65	47	25	214	65
899	26	438	64	438	26	899	64	49	26	205	64
891	27	454	63	454	27	891	63	51	27	196	63
883	28	470	62	470	28	883	62	53	28	188	62
875	29	485	61	485	29	875	61	55	29	180	61
866	30	500	60	500	30	866	60	58	30	173	60
857	31	515	59	515	31	857	59	60	31	166	59
848	32	530	58	530	32	848	58	62	32	160	58
839	33	545	57	545	33	839	57	65	33	154	57
829	34	559	56	559	34	829	56	67	34	148	56
819	35	574	55	574	35	819	55	70	35	143	55
809	36	588	54	588	36	809	54	73	36	138	54
799	37	602	53	602	37	799	53	75	37	133	53
788	38	616	52	616	38	788	52	78	38	128	52
777	39	629	51	629	39	777	51	81	39	123	51
766	40	643	50	643	40	766	50	84	40	119	50
755	41	656	49	656	41	755	49	87	41	115	49
743	42	669	48	669	42	743	48	90	42	111	48
731	43	682	47	682	43	731	47	93	43	107	47
719	44	695	46	695	44	719	46	96	44	103	46
707	45	707	45	707	45	707	45	100	45	100	45

*The Use of the Tables of Difference of Latitude and Departure, in Working any of the Cases of Plain-Sailing.*

**I**N these Tables, the Course if less than 4 Points or 45 Degrees, will be found at the Top of the Tables; but if it is more than 4 Points or 45 Degrees, it will be found at the Bottom of the Tables; and on every Side there are Six Columns for the Distances, mark'd Dist. which contain 50 Miles in each Column, the First beginning at 1, and ending at 50; the Second beginning at 51, and ending at 100, and so on to 300 Miles Distance; and to each of these Columns of Distance there belongs two other Columns, shewing the Difference of Latitude and Departure to any of them Distances, mark'd Lat. and Dep. in which you are to observe, that if your Course be found at the Top of the Tables, then you are to take the Difference of Latitude and Departure as they are mark'd at Top; but if your Course be found at Bottom, then you must take them as they are mark'd at Bottom.

*Note,* In any Case where the Course is given in Points, half Points, or Quarters, you must make use of the following Tables of Difference of Latitude and Departure, which are calculated for Points, &c. but where the Course is given in Degrees, or where it is not given at all, you must make use of the foregoing Tables of Difference of Latitude and Departure.

*Plain-Sailing, Case the First.*

*Course and Distance being given, to find the Difference of Latitude and Departure.*

*Rule.*

Find your Course as before directed, and look in some of the Distance Columns belonging to that Course, for your Distance, the Difference of Latitude and Departure answering to that Distance, will be the Difference of Latitude and Departure required.

*Example*



*Plain Sailing.**Example I.*

*A Ship Sails N. N. E. 136 Miles, I demand her Difference of Latitude and Departure.*

Having found my Course, which is 2 Points in the Table for Points, I find my Distance 136 in the 3<sup>d</sup> Column for Distances, and right against that, I find 125.7 Tenths for my Difference of Latitude, and 52.0 Tenths for my Departure.

*Note,* In all Cases whatsoever, if the given Side or Sides be in Miles, then the Sides found by the Table, will also be in Miles; but if the given Side or Sides be Leagues, then the Sides found will also be Leagues.

*Plain Sailing, Case the Second.*

*Course and Difference of Latitude being given, to find the Distance and Departure.*

*Rule.*

Find your Course as before, then look in some of the Difference of Latitude Columns belonging to that Course, for your Difference of Latitude, the Distance and Departure answering to that Difference of Latitude, will be the Distance and Departure required.

*Example.*

*A Ship Sails S. 48 Degrees 00 Minutes E. till her Difference of Latitude be 164 Leagues, I demand her Distance and Departure?*

Having found my Course 48 Deg. at the Bottom of the Tables, I look in some of the Columns mark'd Lat. at Bottom, for the nearest I can find to my Difference of Latitude, which is 163.9, and answering to that, I find for my Distance 245 Leagues, and for my Departure 182.0 Leagues.

*Plain Sailing, Case the Third.*

*Course and Departure being given, to find the Distance and Difference of Latitude.*

*Rule.*

Find your Course as before, then look in some of the Departure Columns belonging to that Course, for your Departure, the Distance and

and Difference of Latitude answering to that Departure, will be the Distance and Difference of Latitude required.

*Example.*

*A Ship sails S.W. by S. till her Departure be 165 Miles: I demand her Distance and Difference of Latitude.*

Having found the Course, which is 3 Points at the Top of the Table for Points, I look in some of the Columns mark'd *Dep.* at Top, for the nearest I can find to my Departure, which is 165.0, and answering to that I find for my Distance 297 Miles, and for my Difference of Latitude 246,9 Miles.

*Note,* In any Case where the given Side is too big to be found in the Tables, then divide it by 2, 3, 4, or any other Number that will make it small enough to be found, and then the required Sides, when found, must be multiplied by the same Number; but the Course must never be multiplied nor divided.

*Plain Sailing, Case the Fourth.*

*Distance and Difference of Latitude being given, to find the Course and Departure.*

*Rule.*

Put two Cyphers to the Difference of Latitude, and divide it by the Distance (without taking any Notice of the Comma that stands between the Miles and Tenths) and note the Quotient: Then look in the Table of Numbers (at the end of the Tables of Difference of Latitude and Departure) in the Columns belonging to Distance and Difference of Latitude, for the nearest Number to that Quotient, the Degrees answering to that Number will be the Course. Then to find the Departure, proceed as in Case the First. But here you are to observe, that in all Cases where the Course is to be found by the Table of Numbers, the Difference of Latitude and Departure are supposed always to be in Miles and Tenths, as for Example, 112,4 Tenths, 207,9 Tenths, &c. so that if at any Time either of them should be given in Miles without Tenths, as 117, 124, &c. You are then to put a Cypher to them to supply the Place of Tenths, and call them 117,0 Tenths, 124.0 Tenths, &c. and then put two Cyphers more according to your other Rules, to find the Number for the Course.

H

*Example.*



*Example.*

*A Ship Sails between the North and West, till her Distance is 276 Miles, and her Difference of Latitude 211,4 Miles, I demand her Course and Departure.*

Having put two Cyphers to the Difference of Latitude, which makes it 211400, I divide it by the Distance 276, and find the Quotient to be 766 nearly, then I look in the Table of Numbers (under *Dist.* and *Diff.* of *Lat.*) for the nearest to it which is 766, against which I find 40 Degrees for my Course, and with that Course and my given Distance, I find my Departure to be 177,4 Miles, (by Case the First.)

*Plain Sailing, Case the Fifth.*

*Distance and Departure being given, to find the Course and Difference of Latitude.*

*Rule.*

Put two Cyphers to the Departure, then divide it by the Distance, and look in the Table of Numbers, in the Columns belonging to Distance and Departure, for the nearest Number to the Quotient; the Degrees answering to that Number will be the Course, and then the Difference of Latitude may be found, (by Case the First.)

*Example.*

*A Ship Sails between the South and East, till her Distance is 546 Miles, and her Departure 412 Miles, I demand her Course and Difference of Latitude.*

Having put a Cypher to my Departure to supply the Place of Tenths, which makes it 412,0 and then two more Cyphers according to the Rule for this Case, which makes it 412000, I divide it by the Distance 546, and find the Quotient to be 754, against the nearest to which *viz.* 755 in the Table of Numbers under *Dist.* and *Dep.* I find 49 Degrees for my Course; and with that Course and my Distance (divided by 2, because it is too big to be found in the Tables) I find a Difference of Latitude 179,1 (by Case the First) which multiplied by 2, because the Distance was divided by 2, gives 358,2 for my whole Difference of Latitude.

*Plain*

Plain Sailing, Case the Sixth.

*Difference of Latitude and Departure being given, to find the Course and Distance.*

*Rule.*

Put two Cyphers to the Departure, and divide it by the Difference of Latitude, then look in the Table of Numbers, in the Columns belonging to Difference of Latitude and Departure, for the nearest Number to the Quotient, the Degrees answering to that Number will be the Course. Then to find the Distance proceed as in Case the 2d, or 3d.

*Example.*

*A Ship Sails between the North and West, till her Difference of Latitude is 184 Miles, and her Departure 115 Miles, I demand her Course and Distance.*

Having supply'd the Place of Tenths in both these Sides, which makes them 184,0 and 115,0, I then put two Cyphers to the Departure which makes it 115000, and divide it by the Difference of Latitude 1840, and find the Quotient to be 62; against which in the Table of Numbers, under Difference of Latitude and Departure, I find 32 Degrees for my Course, and with that Course, and my Difference of Latitude, (by Case the Second) or with that Course and my Departure (by Case the Third) I find my Distance to be 217 Miles.

*Note,* By these foregoing Rules for *Plain Sailing*, you may work any Case in Traverse, Mercator, Parallel and Middle Latitude, only by supposing the Names of the Sides and Angles in Mercator, Parallel and Middle Latitude to be changed into the Sides and Angles they represent in *Plain Sailing*.

*Traverse.*

*The several Courses and Distances a Ship sails being given, to find what direct Course and Distance she has made good, and her Difference of Latitude and Departure.*

*Rule.*

Make a Table as on the following Side, and set down in it your several Courses and Distances; then by the Rule for Case the First of *Plain Sailing*, find the Difference of Latitude and Departure to each of the



Courses and Distances, and set them down in the Table, opposite to the Courses they belong to, taking Notice that the Difference of Latitude must always be set in the North Column, if the Course be Northerly, and in the South Column if the Course be Southerly; and the Departure must always be put in the East Column, if the Course be Easterly, and in the West Column, if it be Westerly.

Then add up all your Columns of North, South, East and West, separately, and set down their respective Sums at the Bottom of each Column, and if you have but one Column of Northing or Southing, and but one of Easting or Westing, then their Sums will be the Difference of Latitude and Departure of the same Name with the Column they stand under; that is, the Difference of Latitude will be Northerly, if it stands under the North Column; and the Departure Easterly, if it stands under the East Column, &c.

But if you have Numbers in all the Columns of North, South, East, and West, then take the Sums of the North and South Columns, and subtract the lesser from the greater, the Remainder will be the Difference of Latitude, of the same Name with the greater of them: Also do the same with the Sums of the East and West Columns for the Departure; then with that Difference of Latitude and Departure, find the Course and Distance, as in Case the Sixth, of Plain Sailing.

### Example.

*A Ship Sails the following Courses, viz. SSW. 54 Miles, W. by S. 39, NW. by N. 40, NE. by E. 69, and NNW. 60 Miles; I demand her direct Course, Distance, Difference of Latitude and Departure.*

Courses	Dist.	Diff. of Lat.		Departure	
		North	South	East	West.
SSW	54		49.9		20.7
W by S	39		7.6		38.2
NW by N	40	33.3			22.2
NE by E	69	38.3		57.4	
NNW	60	55.4			23.0
		127.0	57.5	57.4	104.1
		57.5			57.4
Diff. Lat N.ly		69.5	DepW.erly		46.7

*Note, 'Tis by this Method, that the Difference of Latitude and Departure are found in working any Days Work at Sea; and from the Difference of Latitude and Departure so found, we find the Course, Distance and Latitude by Dead-Reckoning, Meridian Distance and Longitude made; all which will be further explained in the Rules*

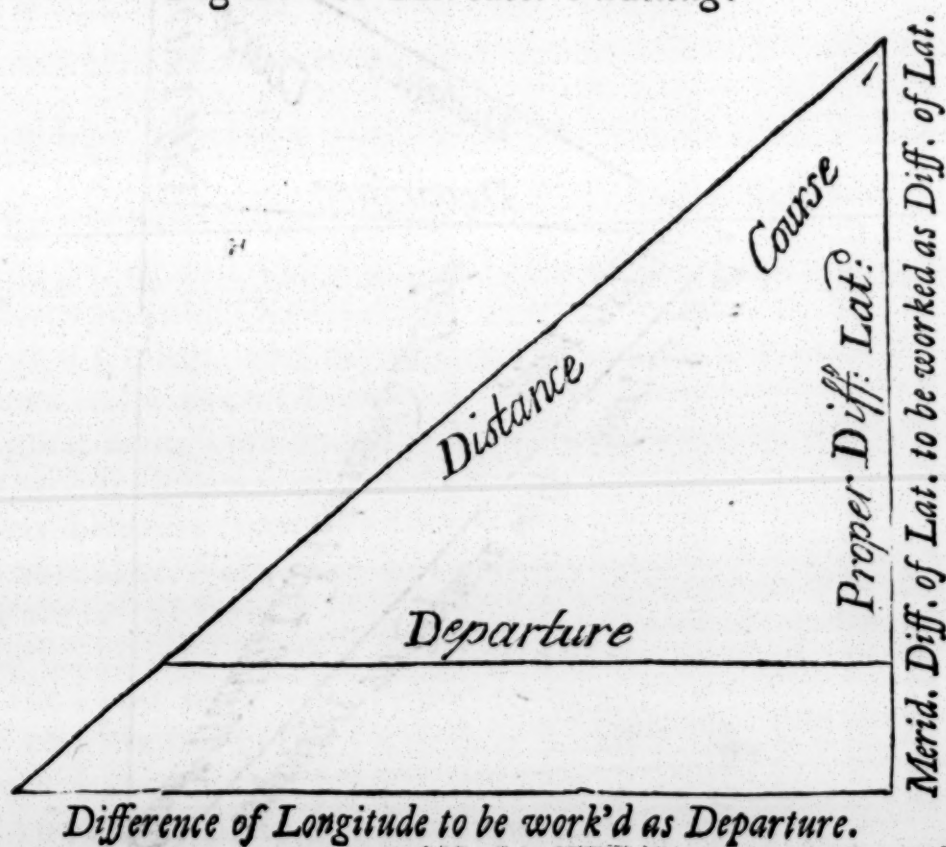
*for keeping a Journal. Course N. 34.00, W. Distance 84 Miles.*

*To Work any Right-angled Triangle, by the foregoing Rules for Plain Sailing.*

In all Right-angled Triangles that are to be work'd by the Tables, you are to suppose four Things, *viz.* Course, Distance, Difference of Latitude and Departure, two of which must always be given to find the other two; Then as these Rules are wrote for working of *Plain Sailing*, if you would work any other Sailing by them, as *Mercator*, *Parallel*, *Middle Latitude*, or any other Right-angled Triangle, you must suppose the Sides and Angles of that Triangle to be called by the same Name that the Sides and Angles they represent in *Plain Sailing* are called by, and then work them as if it was a Case in *Plain Sailing*.

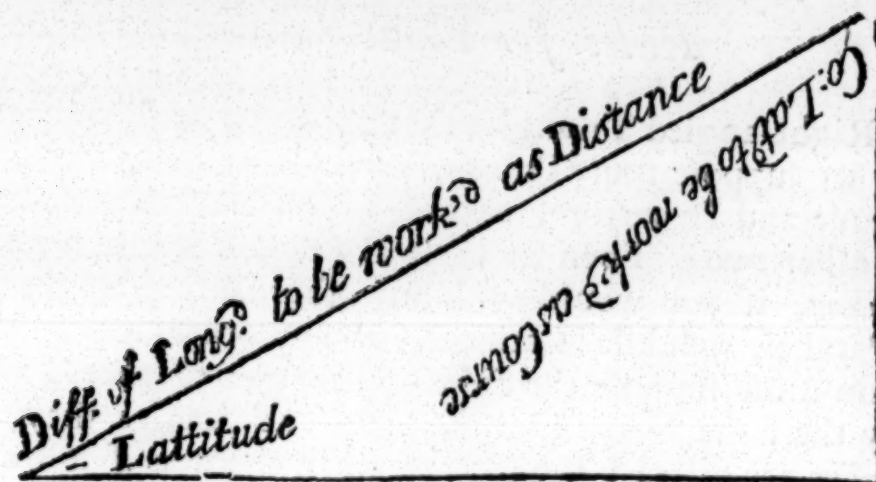
*As for Example.* The North and South Line, in any Right-angled Triangle (by whatever Name it is called in the Sailing it belongs to) must be work'd as if it was Difference of Latitude in *Plain Sailing*: The East and West Line as Departure; the long Side as Distance, and the Angle opposite to the East and West Line as Course. *For Example see the following Figures.*

Figure for *Mercator's Sailing*.

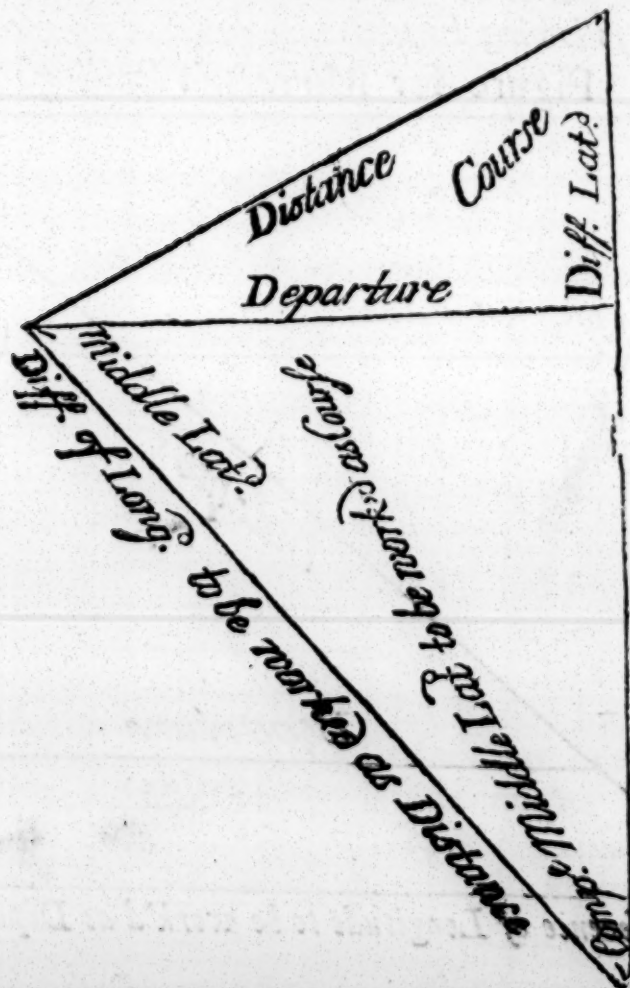


Figure



Figure for *Parallel Sailing*.

Distance to be work'd as Departure.

Figure for *Middle Latitude Sailing*.

Mercator's Sailing, Case the First.

*The Latitudes and Longitudes of any two Places being given, to find what Course and Distance a Ship must Sail from one Place to the other.*

Rule.

Having the two Latitudes and two Longitudes given; find the proper Difference of Latitude, the Meridional Difference of Latitude, and the Difference of Longitude, (as by the Rules for that Purpose) then with the Meridional Difference of Latitude, and the Difference of Longitude (taken as Difference of Latitude and Departure) find the Course by the sixth Case of *Plain Sailing*, and with that Course and the proper Difference of Latitude, find the Distance by Case the Second of *Plain Sailing*.

Example.

*What Course and Distance must a Ship Sail from a Place in Latitude 50.00 North, and Longitude, 03.10 West, to a Place in Latitude of 17.10 North, and Longitude 59.11 West?*

Lat. sail'd from — 50 00 N.	} Merid. Parts	Long. sail'd from 03 10 W.
Lat. bound to — 17 10 N.		Long. bound to 59 11 W.
32 50		56 01
60		60
Proper Diff. of Lat. 1970 Miles	Mer. Diff. of Lat. 2428	Diff. of Long. 3361 Miles

Having put two Cyphers to the Difference of Longitude, and divided it by the Meridional Difference of Latitude, I find the Quotient to be 138, against which in the Table of Numbers (under Difference of Latitude and Departure) I find 54 Degrees for my Course; and with that Course, and my proper Difference of Latitude, I find my Distance to be 3348 Miles.

The Course being thus found in Degrees, I want in the next Place to know which Quarter of the Compass it is in, that is, whether it be so many Degrees from the North towards the East, or from the North towards the West, &c. to do which take the following Rule.

If you are to sail from a greater North Latitude to a less, or from North Latitude into South; or from a lesser South Latitude to a greater, then you must sail to the Southward.

But if you are to sail from a greater South Latitude to a lesser, or from South Latitude into North; or from a less North Latitude to a greater, you must sail to the Northward. If



If you are to sail from a Greater East Longitude to a Lesser, or from a Lesser West Longitude to a Greater; or from East Longitude into West, you must sail to the Westward, except the Difference of Longitude be more than 180 deg. and then you must sail to the Eastward.

But if you are to go from a Greater West Longitude to a Lesser, or from a Lesser East Longitude to a Greater, or from West Longitude into East, you must sail to the Eastward, except your Difference of Longitude be more than 180 deg. and then you must sail to the Westward.

### Example.

In the foregoing Case of Mercator's Sailing, I find by the two Latitudes, that I am bound from a greater North Latitude to a Lesser, viz. from 50.00 N. to 17.10 N. then by the Rule I must sail to the Southward; and I find by the two Longitudes, that I am bound from a Lesser West Longitude to a Greater, viz. from 3.10 West to 59.11 West, then by that Rule I am to go to the Westward, therefore my Course will be South 54.00 West, or SW.  $\frac{1}{4}$  West nearest.

This first Case of Mercator, being the Case that is always made use of, to find the Course and Distance from Place to Place, or to find the Bearing and Distance of any Place, from the Ship at any Time, I have set down the Work of it at large, and shall leave the other Cases for the Reader to exercise himself with, by working them by the Rules already given him.

### A Table of the Angles which every Point of the Compass makes with the Meridian.

	D M		D M		D M		D M
$\frac{1}{4}$	2 49	$2\frac{1}{4}$	25 19	$4\frac{1}{4}$	47 49	$6\frac{1}{4}$	70 19
$\frac{1}{2}$	5 37	$2\frac{1}{2}$	28 07	$4\frac{1}{2}$	50 38	$6\frac{1}{2}$	73 07
$\frac{3}{4}$	8 26	$2\frac{3}{4}$	30 56	$4\frac{3}{4}$	53 26	$6\frac{3}{4}$	75 56
1	11 15	3	33 45	5	56 15	7	78 45
$1\frac{1}{4}$	14 04	$3\frac{1}{4}$	36 34	$5\frac{1}{4}$	59 04	$7\frac{1}{4}$	81 34
$1\frac{1}{2}$	16 52	$3\frac{1}{2}$	39 22	$5\frac{1}{2}$	61 53	$7\frac{1}{2}$	84 23
$1\frac{3}{4}$	19 41	$3\frac{3}{4}$	42 11	$5\frac{3}{4}$	64 41	$7\frac{3}{4}$	87 11
2	22 30	4	45 00	6	67 30	8	90 00

The Use of this Table is to turn Points into Degrees, or Degrees into Points, as follows: Suppose I would know how many Degrees 5 Points are, then I look for 5 Points, and against it I find 56 deg. 15. min. or if I would know how many Points 42 deg. 17 min. are, I look for the nearest to it, which is 42 deg. 11 min. and against that stands  $3\frac{1}{4}$  Points.

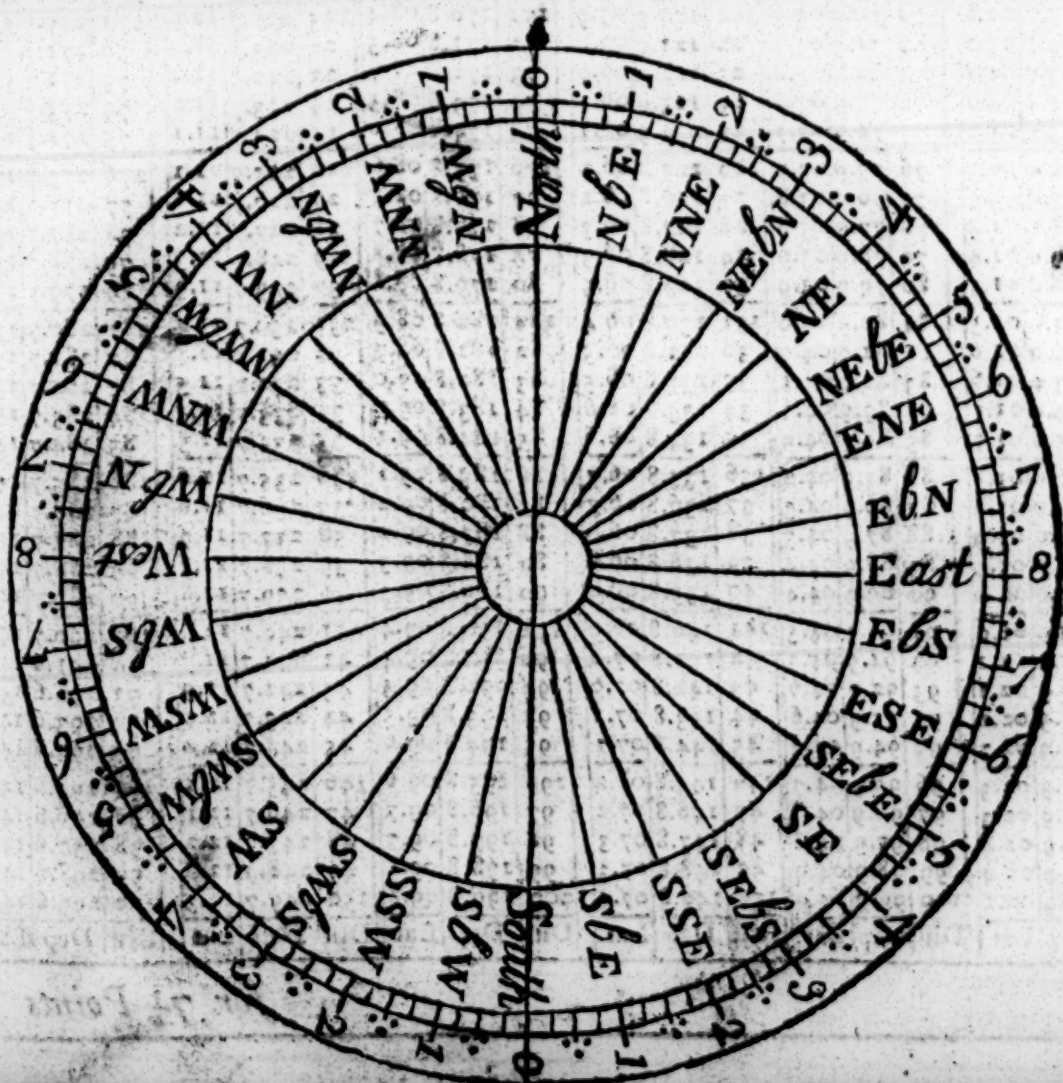
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The Courses and Distances being set down in a Traverse Table, as in Page (52) it will be found necessary for the ready looking them out in the Tables of Difference of Latitude and Departure, to know what Angles they make with the Meridian, (or as we commonly say) to know how many Points there are, for which reason I have here given the Figure of the Mariner's Compass, which is to be used as follows.

*Example 1.* Suppose I would know how many Points I must look out for in the Tables of Difference of Latitude and Departure, for a SW. by W. Course.

Look in the Figure below, and against the Point mark'd with SW. by W. you will see the Figure 5, which shews that you must look out for 5 Points.

*Example 2.* How many Points is E. by N.  $\frac{3}{4}$  E. against E. by N. I find 7, and my Course being  $\frac{3}{4}$  Point more, it makes  $7\frac{3}{4}$ .





Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.0	51	50.9	02.5	101	100.9	05.0	151	150.8	07.4	201	200.8	09.9	251	250.7	12.3
2	02.0	00.1	52	51.9	02.6	102	101.9	05.0	152	151.8	07.5	202	201.8	09.9	252	251.7	12.4
3	03.0	00.1	53	52.9	02.6	103	102.9	05.1	153	152.8	07.5	203	202.8	10.0	253	252.7	12.4
4	04.0	00.2	54	53.9	02.7	104	103.9	05.1	154	153.8	07.6	204	203.8	10.0	254	253.7	12.5
5	05.0	00.2	55	54.9	02.7	105	104.9	05.2	155	154.8	07.6	205	204.8	10.1	255	254.7	12.5
6	06.0	00.3	56	55.9	02.7	106	105.9	05.2	156	155.8	07.7	206	205.8	10.1	256	255.7	12.6
7	07.0	00.3	57	56.9	02.8	107	106.9	05.3	157	156.8	07.7	207	206.8	10.2	257	256.7	12.6
8	08.0	00.4	58	57.9	02.8	108	107.9	05.3	158	157.8	07.8	208	207.8	10.2	258	257.7	12.7
9	09.0	00.4	59	58.9	02.9	109	108.9	05.4	159	158.8	07.8	209	208.7	10.3	259	258.7	12.7
10	10.0	00.5	60	59.9	02.9	110	109.9	05.4	160	159.8	07.9	210	209.7	10.3	260	259.7	12.8
11	11.0	00.5	61	60.9	03.0	111	110.9	05.5	161	160.8	07.9	211	210.7	10.4	261	260.7	12.8
12	12.0	00.6	62	61.9	03.0	112	111.9	05.5	162	161.8	08.0	212	211.7	10.4	262	261.7	12.9
13	13.0	00.6	63	62.9	03.1	113	112.9	05.5	163	162.8	08.0	213	212.7	10.5	263	262.7	12.9
14	14.0	00.7	64	63.9	03.1	114	113.9	05.6	164	163.8	08.1	214	213.7	10.5	264	263.7	13.0
15	15.0	00.7	65	64.9	03.2	115	114.9	05.6	165	164.8	08.1	215	214.7	10.6	265	264.7	13.0
16	16.0	00.8	66	65.9	03.2	116	115.9	05.7	166	165.8	08.2	216	215.7	10.6	266	265.7	13.1
17	17.0	00.8	67	66.9	03.3	117	116.9	05.7	167	166.8	08.2	217	216.7	10.7	267	266.7	13.1
18	18.0	00.9	68	67.9	03.3	118	117.9	05.8	168	167.8	08.3	218	217.7	10.7	268	267.7	13.2
19	19.0	00.9	69	68.9	03.4	119	118.9	05.8	169	168.8	08.3	219	218.7	10.8	269	268.7	13.2
20	20.0	01.0	70	69.9	03.4	120	119.9	05.9	170	169.8	08.4	220	219.7	10.8	270	269.7	13.3
21	21.0	01.0	71	70.9	03.5	121	120.9	05.9	171	170.8	08.4	221	220.7	10.9	271	270.7	13.3
22	22.0	01.1	72	71.9	03.5	122	121.9	06.0	172	171.8	08.5	222	221.7	10.9	272	271.7	13.4
23	23.0	01.1	73	72.9	03.6	123	122.9	06.0	173	172.8	08.5	223	222.7	11.0	273	272.7	13.4
24	24.0	01.2	74	73.9	03.6	124	123.9	06.1	174	173.8	08.5	224	223.7	11.0	274	273.7	13.5
25	25.0	01.2	75	74.9	03.7	125	124.9	06.1	175	174.8	08.6	225	224.7	11.1	275	274.7	13.5
26	26.0	01.3	76	75.9	03.7	126	125.8	06.2	176	175.8	08.6	226	225.7	11.1	276	275.7	13.6
27	27.0	01.3	77	76.9	03.8	127	126.8	06.2	177	176.8	08.7	227	226.7	11.2	277	276.7	13.6
28	28.0	01.4	78	77.9	03.8	128	127.8	06.3	178	177.8	08.7	228	227.7	11.2	278	277.7	13.7
29	29.0	01.4	79	78.9	03.9	129	128.8	06.3	179	178.8	08.8	229	228.7	11.3	279	278.7	13.7
30	30.0	01.5	80	79.9	03.9	130	129.8	06.4	180	179.8	08.8	230	229.7	11.3	280	279.7	13.8
31	31.0	01.5	81	80.9	04.0	131	130.8	06.4	181	180.8	08.9	231	230.7	11.4	281	280.7	13.8
32	32.0	01.6	82	81.9	04.0	132	131.8	06.5	182	181.8	08.9	232	231.7	11.4	282	281.7	13.9
33	33.0	01.6	83	82.9	04.1	133	132.8	06.5	183	182.8	09.0	233	232.7	11.5	283	282.7	13.9
34	34.0	01.7	84	83.9	04.1	134	133.8	06.6	184	183.8	09.0	234	233.7	11.5	284	283.7	14.0
35	35.0	01.7	85	84.9	04.2	135	134.8	06.6	185	184.8	09.1	235	234.7	11.5	285	284.7	14.0
36	36.0	01.8	86	85.9	04.2	136	135.8	06.7	186	185.8	09.1	236	235.7	11.6	286	285.7	14.1
37	37.0	01.8	87	86.9	04.3	137	136.8	06.7	187	186.8	09.2	237	236.7	11.6	287	286.7	14.1
38	38.0	01.9	88	87.9	04.3	138	137.8	06.8	188	187.8	09.2	238	237.7	11.7	288	287.7	14.2
39	39.0	01.9	89	88.9	04.4	139	138.8	06.8	189	188.8	09.3	239	238.7	11.7	289	288.7	14.2
40	40.0	02.0	90	89.9	04.4	140	139.8	06.9	190	189.8	09.3	240	239.7	11.8	290	289.7	14.3
41	41.0	02.0	91	90.9	04.5	141	140.8	06.9	191	190.8	09.4	241	240.7	11.8	291	290.7	14.3
42	41.9	02.1	92	91.9	04.5	142	141.8	07.0	192	191.8	09.4	242	241.7	11.9	292	291.6	14.4
43	42.9	02.1	93	92.9	04.6	143	142.8	07.0	193	192.8	09.5	243	242.7	11.9	293	292.6	14.4
44	43.9	02.2	94	93.9	04.6	144	143.8	07.1	194	193.8	09.5	244	243.7	12.0	294	293.6	14.5
45	44.9	02.2	95	94.9	04.7	145	144.8	07.1	195	194.8	09.6	245	244.7	12.0	295	294.6	14.5
46	45.9	02.3	96	95.9	04.7	146	145.8	07.2	196	195.8	09.6	246	245.7	12.1	296	295.6	14.5
47	46.9	02.3	97	96.9	04.8	147	146.8	07.2	197	196.8	09.7	247	246.7	12.1	297	296.6	14.6
48	47.9	02.4	98	97.9	04.8	148	147.8	07.3	198	197.8	09.7	248	247.7	12.2	298	297.6	14.6
49	48.9	02.4	99	98.9	04.9	149	148.8	07.3	199	198.8	09.8	249	248.7	12.2	299	298.6	14.7
50	49.9	02.5	100	99.9	04.9	150	149.8	07.4	200	199.8	09.8	250	249.7	12.3	300	299.6	14.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $7\frac{1}{4}$  Points

# *Difference of Latitude and Departure for $\frac{1}{2}$ Point.*

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Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.8	05.0	101	100.5	09.9	151	150.3	14.8	201	200.0	19.7	251	249.8	24.6
2	02.0	00.2	52	51.8	05.1	02	101.5	10.0	52	151.3	14.9	02	201.0	19.8	52	250.8	24.7
3	03.0	00.3	53	52.7	05.2	03	102.5	10.1	53	152.3	15.0	03	202.0	19.9	53	251.8	24.8
4	04.0	00.4	54	53.7	05.3	04	103.5	10.2	54	153.3	15.1	04	203.0	20.0	54	252.8	24.9
5	05.0	00.5	55	54.7	05.4	05	104.5	10.3	55	154.3	15.2	05	204.0	20.1	55	253.8	25.0
6	06.0	00.6	56	55.7	05.5	106	105.5	10.4	156	155.3	15.3	206	205.0	20.2	256	254.8	25.1
7	07.0	00.7	57	56.7	05.6	07	106.5	10.5	57	156.2	15.4	07	206.0	20.2	57	255.8	25.2
8	08.0	00.8	58	57.7	05.7	08	107.5	10.6	58	157.2	15.5	08	207.0	20.3	58	256.8	25.3
9	09.0	00.9	59	58.7	05.8	09	108.5	10.7	59	158.2	15.6	09	208.0	20.4	59	257.8	25.4
10	10.0	01.0	60	59.7	05.9	10	109.5	10.8	60	159.2	15.7	10	209.0	20.5	60	258.8	25.5
11	10.9	01.1	61	60.7	06.0	111	110.5	10.9	161	160.2	15.7	211	210.0	20.6	261	259.7	25.6
12	11.9	01.2	62	61.7	06.1	12	111.5	11.0	62	161.2	15.8	12	211.0	20.7	62	260.7	25.7
13	12.9	01.3	63	62.7	06.2	13	112.5	11.1	63	162.2	15.9	13	212.0	20.8	63	261.7	25.8
14	13.9	01.4	64	63.7	06.3	14	113.5	11.2	64	163.2	16.0	14	213.0	20.9	64	262.7	25.9
15	14.9	01.5	65	64.7	06.4	15	114.4	11.2	65	164.2	16.1	15	214.0	21.0	65	263.7	26.0
16	15.9	01.6	66	65.7	06.5	116	115.4	11.3	166	165.2	16.2	216	215.0	21.1	266	264.7	26.1
17	16.9	01.7	67	66.7	06.6	17	116.4	11.4	67	166.2	16.3	17	216.0	21.2	67	265.7	26.2
18	17.9	01.8	68	67.7	06.7	18	117.4	11.5	68	167.2	16.4	18	217.0	21.3	68	266.7	26.3
19	18.9	01.9	69	68.7	06.7	19	118.4	11.6	69	168.2	16.5	19	217.9	21.4	69	267.7	26.4
20	19.9	02.0	70	69.7	06.8	20	119.4	11.7	70	169.2	16.6	20	218.9	21.5	70	268.7	26.5
21	20.9	02.1	71	70.7	06.9	121	120.4	11.8	171	170.2	16.7	221	219.9	21.6	271	269.7	26.6
22	21.9	02.2	72	71.7	07.0	22	121.4	11.9	72	171.2	16.8	22	220.9	21.7	72	270.7	26.7
23	22.9	02.2	73	72.6	07.1	23	122.4	12.0	73	172.2	16.9	23	221.9	21.8	73	271.7	26.8
24	23.9	02.3	74	73.6	07.2	24	123.4	12.1	74	173.2	17.0	24	222.9	21.9	74	272.7	26.9
25	24.9	02.4	75	74.6	07.3	25	124.4	12.2	75	174.2	17.1	25	223.9	22.0	75	273.7	27.0
26	25.9	02.5	76	75.6	07.4	126	125.4	12.3	176	175.2	17.2	226	224.9	22.1	276	274.7	27.1
27	26.9	02.6	77	76.6	07.5	27	126.4	12.4	77	176.2	17.3	27	225.9	22.2	77	275.7	27.2
28	27.9	02.7	78	77.6	07.6	28	127.4	12.5	78	177.1	17.4	28	226.9	22.3	78	276.7	27.3
29	28.9	02.8	79	78.6	07.7	29	128.4	12.6	79	178.1	17.5	29	227.9	22.4	79	277.7	27.4
30	29.9	02.9	80	79.6	07.8	30	129.4	12.7	80	179.1	17.6	30	228.9	22.5	80	278.7	27.5
31	30.9	03.0	81	80.6	07.9	131	130.4	12.8	181	180.1	17.7	231	229.9	22.6	281	279.6	27.6
32	31.8	03.1	82	81.6	08.0	32	131.4	12.9	82	181.1	17.8	32	230.9	22.7	82	280.6	27.7
33	32.8	03.2	83	82.6	08.1	33	132.4	13.0	83	182.1	17.9	33	231.9	22.8	83	281.6	27.8
34	33.8	03.3	84	83.6	08.2	34	133.4	13.1	84	183.1	18.0	34	232.9	22.9	84	282.6	27.9
35	34.8	03.4	85	84.6	08.3	35	134.4	13.2	85	184.1	18.1	35	233.9	23.0	85	283.6	28.0
36	35.8	03.5	86	85.6	08.4	136	135.3	13.3	186	185.1	18.2	236	234.9	23.1	286	284.6	28.1
37	36.8	03.6	87	86.6	08.5	37	136.3	13.4	87	186.1	18.3	37	235.9	23.2	87	285.6	28.2
38	37.8	03.7	88	87.6	08.6	38	137.3	13.5	88	187.1	18.4	38	236.9	23.3	88	286.6	28.3
39	38.8	03.8	89	88.6	08.7	39	138.3	13.6	89	188.1	18.5	39	237.9	23.4	89	287.6	28.4
40	39.8	03.9	90	89.6	08.8	40	139.3	13.7	90	189.1	18.6	40	238.8	23.5	90	288.6	28.5
41	40.8	04.0	91	90.6	08.9	141	140.3	13.8	191	190.1	18.7	241	239.8	23.6	291	289.6	28.6
42	41.8	04.1	92	91.6	09.0	42	141.3	13.9	92	191.1	18.8	42	240.8	23.7	92	290.6	28.7
43	42.8	04.2	93	92.6	09.1	43	142.3	14.0	93	192.1	18.9	43	241.8	23.8	93	291.6	28.8
44	43.8	04.3	94	93.5	09.2	44	143.3	14.1	94	193.1	19.0	44	242.8	23.9	94	292.6	28.9
45	44.8	04.4	95	94.5	09.3	45	144.3	14.2	95	194.1	19.1	45	243.8	24.0	95	293.6	29.0
46	45.8	04.5	96	95.5	09.4	146	145.3	14.3	196	195.1	19.2	246	244.8	24.1	296	294.6	29.1
47	46.8	04.6	97	96.5	09.5	47	146.3	14.4	97	196.1	19.3	47	245.8	24.2	97	295.6	29.2
48	47.8	04.7	98	97.5	09.6	48	147.3	14.5	98	197.0	19.4	48	246.8	24.3	98	296.6	29.2
49	48.8	04.8	99	98.5	09.7	49	148.3	14.6	99	198.0	19.5	49	247.8	24.4	99	297.6	29.3
50	49.8	04.9	100	99.5	09.8	150	149.3	14.7	200	199.0	19.6	250	248.8	24.5	300	298.6	29.4
Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep

for  $7 \frac{1}{2}$  Points.



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.0	51	50.9	02.5	101	100.9	05.0	151	150.8	07.4	201	200.8	09.9	251	250.7	12.3
2	02.0	00.1	52	51.9	02.6	02	101.9	05.0	52	151.8	07.5	02	201.8	09.9	52	251.7	12.4
3	03.0	00.1	53	52.9	02.6	03	102.9	05.1	53	152.8	07.5	03	202.8	10.0	53	252.7	12.4
4	04.0	00.2	54	53.9	02.7	04	103.9	05.1	54	153.8	07.6	04	203.8	10.0	54	253.7	12.5
5	05.0	00.2	55	54.9	02.7	05	104.9	05.2	55	154.8	07.6	05	204.8	10.1	55	254.7	12.5
6	06.0	00.3	56	55.9	02.7	106	105.9	05.2	156	155.8	07.7	206	205.8	10.1	256	255.7	12.6
7	07.0	00.3	57	56.9	02.8	07	106.9	05.3	57	156.8	07.7	07	206.8	10.2	57	256.7	12.6
8	08.0	00.4	58	57.9	02.8	08	107.9	05.3	58	157.8	07.8	08	207.8	10.2	58	257.7	12.7
9	09.0	00.4	59	58.9	02.9	09	108.9	05.4	59	158.8	07.8	09	208.7	10.3	59	258.7	12.7
10	10.0	00.5	60	59.9	02.9	10	109.9	05.4	60	159.8	07.9	10	209.7	10.3	60	259.7	12.8
11	11.0	00.5	61	60.9	03.0	111	110.9	05.5	161	160.8	07.9	211	210.7	10.4	261	260.7	12.8
12	12.0	00.6	62	61.9	03.0	12	111.9	05.5	62	161.8	08.0	12	211.7	10.4	62	261.7	12.9
13	13.0	00.6	63	62.9	03.1	13	112.9	05.5	63	162.8	08.0	13	212.7	10.5	63	262.7	12.9
14	14.0	00.7	64	63.9	03.1	14	113.9	05.6	64	163.8	08.1	14	213.7	10.5	64	263.7	13.0
15	15.0	00.7	65	64.9	03.2	15	114.9	05.6	65	164.8	08.1	15	214.7	10.6	65	264.7	13.0
16	16.0	00.8	66	65.9	03.2	116	115.9	05.7	166	165.8	08.2	216	215.7	10.6	266	265.7	13.1
17	17.0	00.8	67	66.9	03.3	17	116.9	05.7	67	166.8	08.2	17	216.7	10.7	67	266.7	13.1
18	18.0	00.9	68	67.9	03.3	18	117.9	05.8	68	167.8	08.3	18	217.7	10.7	68	267.7	13.2
19	19.0	00.9	69	68.9	03.4	19	118.9	05.8	69	168.8	08.3	19	218.7	10.8	69	268.7	13.2
20	20.0	01.0	70	69.9	03.4	20	119.9	05.9	70	169.8	08.4	20	219.7	10.8	70	269.7	13.3
21	21.0	01.0	71	70.9	03.5	121	120.9	05.9	171	170.8	08.4	221	220.7	10.9	271	270.7	13.3
22	22.0	01.1	72	71.9	03.5	22	121.9	06.0	72	171.8	08.5	22	221.7	10.9	72	271.7	13.4
23	23.0	01.1	73	72.9	03.6	23	122.9	06.0	73	172.8	08.5	23	222.7	11.0	73	272.7	13.4
24	24.0	01.2	74	73.9	03.6	24	123.9	06.1	74	173.8	08.5	24	223.7	11.0	74	273.7	13.5
25	25.0	01.2	75	74.9	03.7	25	124.9	06.1	75	174.8	08.6	25	224.7	11.1	75	274.7	13.5
26	26.0	01.3	76	75.9	03.7	126	125.8	06.2	176	175.8	08.6	226	225.7	11.1	276	275.7	13.6
27	27.0	01.3	77	76.9	03.8	27	126.8	06.2	77	176.8	08.7	27	226.7	11.2	77	276.7	13.6
28	28.0	01.4	78	77.9	03.8	28	127.8	06.3	78	177.8	08.7	28	227.7	11.2	78	277.7	13.7
29	29.0	01.4	79	78.9	03.9	29	128.8	06.3	79	178.8	08.8	29	228.7	11.3	79	278.7	13.7
30	30.0	01.5	80	79.9	03.9	30	129.8	06.4	80	179.8	08.8	30	229.7	11.3	80	279.7	13.8
31	31.0	01.5	81	80.9	04.0	131	130.8	06.4	181	180.8	08.9	231	230.7	11.4	281	280.7	13.8
32	32.0	01.6	82	81.9	04.0	32	131.8	06.5	82	181.8	08.9	32	231.7	11.4	82	281.7	13.9
33	33.0	01.6	83	82.9	04.1	33	132.8	06.5	83	182.8	09.0	33	232.7	11.5	83	282.7	13.9
34	34.0	01.7	84	83.9	04.1	34	133.8	06.6	84	183.8	09.0	34	233.7	11.5	84	283.7	14.0
35	35.0	01.7	85	84.9	04.2	35	134.8	06.6	85	184.8	09.1	35	234.7	11.5	85	284.7	14.0
36	36.0	01.8	86	85.9	04.2	136	135.8	06.7	186	185.8	09.1	236	235.7	11.6	286	285.7	14.1
37	37.0	01.8	87	86.9	04.3	37	136.8	06.7	87	186.8	09.2	37	236.7	11.6	87	286.7	14.1
38	38.0	01.9	88	87.9	04.3	38	137.8	06.8	88	187.8	09.2	38	237.7	11.7	88	287.7	14.2
39	39.0	01.9	89	88.9	04.4	39	138.8	06.8	89	188.8	09.3	39	238.7	11.7	89	288.7	14.2
40	40.0	02.0	90	89.9	04.4	40	139.8	06.9	90	189.8	09.3	40	239.7	11.8	90	289.7	14.3
41	41.0	02.0	91	90.9	04.5	141	140.8	06.9	191	190.8	09.4	241	240.7	11.8	291	290.7	14.3
42	41.9	02.1	92	91.9	04.5	42	141.8	07.0	92	191.8	09.4	42	241.7	11.9	92	291.6	14.4
43	42.9	02.1	93	92.9	04.6	43	142.8	07.0	93	192.8	09.5	43	242.7	11.9	93	292.6	14.4
44	43.9	02.2	94	93.9	04.6	44	143.8	07.1	94	193.8	09.5	44	243.7	12.0	94	293.6	14.5
45	44.9	02.2	95	94.9	04.7	45	144.8	07.1	95	194.8	09.6	45	244.7	12.0	95	294.6	14.5
46	45.9	02.3	96	95.9	04.7	146	145.8	07.2	196	195.8	09.6	246	245.7	12.1	296	295.6	14.5
47	46.9	02.3	97	96.9	04.8	47	146.8	07.2	97	196.8	09.7	47	246.7	12.1	97	296.6	14.6
48	47.9	02.4	98	97.9	04.8	48	147.8	07.3	98	197.8	09.7	48	247.7	12.2	98	297.6	14.6
49	48.9	02.4	99	98.9	04.9	49	148.8	07.3	99	198.8	09.8	49	248.7	12.2	99	298.6	14.7
50	49.9	02.5	100	99.9	04.9	150	149.8	07.4	200	199.8	09.8	250	249.7	12.3	300	299.6	14.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $7\frac{1}{4}$  Points

# Difference of Latitude and Departure for $\frac{1}{2}$ Point.

59

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.8	05.0	101	100.5	09.9	151	150.3	14.8	201	200.0	19.7	251	249.8	24.6
2	02.0	00.2	52	51.8	05.1	102	101.5	10.0	152	151.3	14.9	202	201.0	19.8	252	250.8	24.7
3	03.0	00.3	53	52.7	05.2	103	102.5	10.1	153	152.3	15.0	203	202.0	19.9	253	251.8	24.8
4	04.0	00.4	54	53.7	05.3	104	103.5	10.2	154	153.3	15.1	204	203.0	20.0	254	252.8	24.9
5	05.0	00.5	55	54.7	05.4	105	104.5	10.3	155	154.3	15.2	205	204.0	20.1	255	253.8	25.0
6	06.0	00.6	56	55.7	05.5	106	105.5	10.4	156	155.3	15.3	206	205.0	20.2	256	254.8	25.1
7	07.0	00.7	57	56.7	05.6	107	106.5	10.5	157	156.2	15.4	207	206.0	20.2	257	255.8	25.2
8	08.0	00.8	58	57.7	05.7	108	107.5	10.6	158	157.2	15.5	208	207.0	20.3	258	256.8	25.3
9	09.0	00.9	59	58.7	05.8	109	108.5	10.7	159	158.2	15.6	209	208.0	20.4	259	257.8	25.4
10	10.0	01.0	60	59.7	05.9	110	109.5	10.8	160	159.2	15.7	210	209.0	20.5	260	258.8	25.5
11	10.9	01.1	61	60.7	06.0	111	110.5	10.9	161	160.2	15.7	211	210.0	20.6	261	259.7	25.6
12	11.9	01.2	62	61.7	06.1	112	111.5	11.0	162	161.2	15.8	12	211.0	20.7	62	260.7	25.7
13	12.9	01.3	63	62.7	06.2	113	112.5	11.1	163	162.2	15.9	13	212.0	20.8	63	261.7	25.8
14	13.9	01.4	64	63.7	06.3	114	113.5	11.2	164	163.2	16.0	14	213.0	20.9	64	262.7	25.9
15	14.9	01.5	65	64.7	06.4	115	114.4	11.2	165	164.2	16.1	15	214.0	21.0	65	263.7	26.0
16	15.9	01.6	66	65.7	06.5	116	115.4	11.3	166	165.2	16.2	216	215.0	21.1	266	264.7	26.1
17	16.9	01.7	67	66.7	06.6	117	116.4	11.4	167	166.2	16.3	17	216.0	21.2	67	265.7	26.2
18	17.9	01.8	68	67.7	06.7	118	117.4	11.5	168	167.2	16.4	18	217.0	21.3	68	266.7	26.3
19	18.9	01.9	69	68.7	06.7	119	118.4	11.6	169	168.2	16.5	19	217.9	21.4	69	267.7	26.4
20	19.9	02.0	70	69.7	06.8	120	119.4	11.7	170	169.2	16.6	20	218.9	21.5	70	268.7	26.5
21	20.9	02.1	71	70.7	06.9	121	120.4	11.8	171	170.2	16.7	221	219.9	21.6	271	269.7	26.6
22	21.9	02.2	72	71.7	07.0	122	121.4	11.9	172	171.2	16.8	22	220.9	21.7	72	270.7	26.7
23	22.9	02.2	73	72.6	07.1	123	122.4	12.0	173	172.2	16.9	23	221.9	21.8	73	271.7	26.8
24	23.9	02.3	74	73.6	07.2	124	123.4	12.1	174	173.2	17.0	24	222.9	21.9	74	272.7	26.9
25	24.9	02.4	75	74.6	07.3	125	124.4	12.2	175	174.2	17.1	25	223.9	22.0	75	273.7	27.0
26	25.9	02.5	76	75.6	07.4	126	125.4	12.3	176	175.2	17.2	226	224.9	22.1	276	274.7	27.1
27	26.9	02.6	77	76.6	07.5	127	126.4	12.4	177	176.2	17.3	27	225.9	22.2	77	275.7	27.2
28	27.9	02.7	78	77.6	07.6	128	127.4	12.5	178	177.1	17.4	28	226.9	22.3	78	276.7	27.3
29	28.9	02.8	79	78.6	07.7	129	128.4	12.6	179	178.1	17.5	29	227.9	22.4	79	277.7	27.4
30	29.9	02.9	80	79.6	07.8	130	129.4	12.7	180	179.1	17.6	30	228.9	22.5	80	278.7	27.5
31	30.9	03.0	81	80.6	07.9	131	130.4	12.8	181	180.1	17.7	231	229.9	22.6	281	279.6	27.6
32	31.8	03.1	82	81.6	08.0	132	131.4	12.9	182	181.1	17.8	32	230.9	22.7	82	280.6	27.7
33	32.8	03.2	83	82.6	08.1	133	132.4	13.0	183	182.1	17.9	33	231.9	22.8	83	281.6	27.8
34	33.8	03.3	84	83.6	08.2	134	133.4	13.1	184	183.1	18.0	34	232.9	22.9	84	282.6	27.9
35	34.8	03.4	85	84.6	08.3	135	134.4	13.2	185	184.1	18.1	35	233.9	23.0	85	283.6	28.0
36	35.8	03.5	86	85.6	08.4	136	135.3	13.3	186	185.1	18.2	236	234.9	23.1	286	284.6	28.1
37	36.8	03.6	87	86.6	08.5	137	136.3	13.4	187	186.1	18.3	37	235.9	23.2	87	285.6	28.2
38	37.8	03.7	88	87.6	08.6	138	137.3	13.5	188	187.1	18.4	38	236.9	23.3	88	286.6	28.3
39	38.8	03.8	89	88.6	08.7	139	138.3	13.6	189	188.1	18.5	39	237.9	23.4	89	287.6	28.4
40	39.8	03.9	90	89.6	08.8	140	139.3	13.7	190	189.1	18.6	40	238.8	23.5	90	288.6	28.5
41	40.8	04.0	91	90.6	08.9	141	140.3	13.8	191	190.1	18.7	241	239.8	23.6	291	289.6	28.6
42	41.8	04.1	92	91.6	09.0	142	141.3	13.9	192	191.1	18.8	42	240.8	23.7	92	290.6	28.7
43	42.8	04.2	93	92.6	09.1	143	142.3	14.0	193	192.1	18.9	43	241.8	23.8	93	291.6	28.8
44	43.8	04.3	94	93.5	09.2	144	143.3	14.1	194	193.1	19.0	44	242.8	23.9	94	292.6	28.9
45	44.8	04.4	95	94.5	09.3	145	144.3	14.2	195	194.1	19.1	45	243.8	24.0	95	293.6	29.0
46	45.8	04.5	96	95.5	09.4	146	145.3	14.3	196	195.1	19.2	246	244.8	24.1	296	294.6	29.1
47	46.8	04.6	97	96.5	09.5	147	146.3	14.4	197	196.1	19.3	47	245.8	24.2	97	295.6	29.2
48	47.8	04.7	98	97.5	09.6	148	147.3	14.5	198	197.0	19.4	48	246.8	24.3	98	296.6	29.2
49	48.8	04.8	99	98.5	09.7	149	148.3	14.6	199	198.0	19.5	49	247.8	24.4	99	297.6	29.3
50	49.8	04.9	100	99.5	09.8	150	149.3	14.7	200	199.0	19.6	250	248.8	24.5	300	298.6	29.4
Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep

for  $7 \frac{1}{2}$  Points.



Difference of Latitude and Departure for  $\frac{1}{4}$  Points.

Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep
1	01.0	00.1	51	50.4	07.5	101	99.9	14.3	151	149.4	22.1	201	198.8	29.5	251	248.3	36.8
2	02.0	00.3	52	51.4	07.6	02	100.9	15.0	52	150.3	22.3	02	199.8	29.6	52	249.3	37.0
3	03.0	00.4	53	52.4	07.8	03	101.9	15.1	53	151.3	22.4	03	200.8	29.8	53	250.2	37.2
4	04.0	00.6	54	53.4	07.9	04	102.9	15.3	54	152.3	22.6	04	201.8	29.9	54	251.2	37.3
5	04.9	00.7	55	54.4	08.1	05	103.9	15.4	55	153.3	22.7	05	202.8	30.1	55	252.2	37.4
6	05.9	00.9	56	55.4	08.2	106	104.8	15.5	156	154.3	22.9	206	203.8	30.2	256	253.2	37.5
7	06.9	01.0	57	56.4	08.4	07	105.8	15.7	57	155.3	23.0	07	204.7	30.4	57	254.2	37.7
8	07.9	01.2	58	57.4	08.5	08	106.8	15.8	58	156.3	23.2	08	205.7	30.5	58	255.2	37.8
9	08.9	01.3	59	58.4	08.6	09	107.8	16.0	59	157.3	23.3	09	206.7	30.6	59	256.2	38.0
10	09.9	01.5	60	59.3	08.8	10	108.8	16.1	60	158.3	23.5	10	207.7	30.8	60	257.2	38.1
11	10.9	01.6	61	60.3	08.9	111	109.8	16.3	161	159.2	23.6	211	208.7	30.9	261	258.2	38.3
12	11.9	01.8	62	61.3	09.1	12	110.8	16.4	62	160.2	23.8	12	209.7	31.1	62	259.1	38.4
13	12.9	01.9	63	62.3	09.2	13	111.8	16.6	63	161.2	23.9	13	210.7	31.2	63	260.1	38.6
14	13.8	02.1	64	63.3	09.4	14	112.8	16.7	64	162.2	24.0	14	211.7	31.4	64	261.1	38.7
15	14.8	02.2	65	64.3	09.5	15	113.7	16.9	65	163.2	24.2	15	212.7	31.5	65	262.1	38.9
16	15.8	02.3	66	65.3	09.7	116	114.7	17.0	166	164.2	24.3	216	213.7	31.7	266	263.1	39.0
17	16.8	02.5	67	66.3	09.8	17	115.7	17.2	67	165.2	24.5	17	214.6	31.8	67	264.1	39.2
18	17.8	02.6	68	67.3	10.0	18	116.7	17.3	68	166.2	24.6	18	215.6	32.0	68	265.1	39.3
19	18.8	02.8	69	68.2	10.1	19	117.7	17.5	69	167.2	24.8	19	216.6	32.1	69	266.1	39.5
20	19.8	02.9	70	69.2	10.3	20	118.7	17.6	70	168.1	24.9	20	217.6	32.3	70	267.1	39.6
21	20.8	03.1	71	70.2	10.4	121	119.7	17.7	171	169.1	25.1	221	218.6	32.4	271	268.1	39.7
22	21.8	03.2	72	71.2	10.6	22	120.7	17.9	72	170.1	25.2	22	219.6	32.6	72	269.0	39.9
23	22.7	03.4	73	72.2	10.7	23	121.7	18.0	73	171.1	25.4	23	220.6	32.7	73	270.0	40.0
24	23.7	03.5	74	73.2	10.8	24	122.7	18.2	74	172.1	25.5	24	221.6	32.8	74	271.0	40.2
25	24.7	03.7	75	74.2	11.0	25	123.6	18.3	75	173.1	25.7	25	222.6	33.0	75	272.0	40.3
26	25.7	03.8	76	75.2	11.1	126	124.6	18.5	176	174.1	25.8	226	223.5	33.1	276	273.0	40.5
27	26.7	04.0	77	76.2	11.3	27	125.6	18.6	77	175.1	26.0	27	224.5	33.3	77	274.0	40.6
28	27.7	04.1	78	77.1	11.4	28	126.6	18.8	78	176.1	26.1	28	225.5	33.4	78	275.0	40.8
29	28.7	04.3	79	78.1	11.6	29	127.6	18.9	79	177.1	26.3	29	226.5	33.6	79	276.0	40.9
30	29.7	04.4	80	79.1	11.7	30	128.6	19.1	80	178.0	26.4	30	227.5	33.7	80	277.0	41.1
31	30.7	04.5	81	80.1	11.9	131	129.6	19.2	181	179.0	26.5	231	228.5	33.9	281	277.9	41.2
32	31.7	04.7	82	81.1	12.0	32	130.6	19.4	82	180.0	26.7	32	229.5	34.0	82	278.9	41.4
33	32.6	04.8	83	82.1	12.2	33	131.6	19.5	83	181.0	26.8	33	230.5	34.2	83	279.9	41.5
34	33.6	05.0	84	83.1	12.3	34	132.5	19.6	84	182.0	27.0	34	231.5	34.3	84	280.9	41.6
35	34.6	05.1	85	84.1	12.5	35	133.5	19.8	85	183.0	27.1	35	232.4	34.5	85	281.9	41.8
36	35.6	05.3	86	85.1	12.6	136	134.5	19.9	186	184.0	27.3	236	233.4	34.6	286	282.9	41.9
37	36.6	05.4	87	86.1	12.8	37	135.5	20.1	87	185.0	27.4	37	234.4	34.8	87	283.9	42.1
38	37.6	05.6	88	87.0	12.9	38	136.5	20.2	88	186.0	27.6	38	235.4	34.9	88	284.9	42.2
39	38.6	05.7	89	88.0	13.0	39	137.5	20.4	89	186.9	27.7	39	236.4	35.0	89	285.9	42.4
40	39.6	05.9	90	89.0	13.2	40	138.5	20.5	90	187.9	27.9	40	237.4	35.2	90	286.8	42.5
41	40.6	06.0	91	90.0	13.3	141	139.5	20.7	191	188.9	28.0	241	238.4	35.3	291	287.8	42.7
42	41.5	06.2	92	91.0	13.5	42	140.5	20.8	92	189.9	28.2	42	239.4	35.5	92	288.8	42.8
43	42.5	06.3	93	92.0	13.6	43	141.4	21.0	93	190.9	28.3	43	240.4	35.6	93	289.8	43.0
44	43.5	06.5	94	93.0	13.8	44	142.4	21.1	94	191.9	28.5	44	241.3	35.8	94	290.8	43.1
45	44.5	06.6	95	94.0	13.9	45	143.4	21.3	95	192.9	28.6	45	242.3	35.9	95	291.8	43.3
46	45.5	06.7	96	95.0	14.1	146	144.4	21.4	196	193.9	28.7	246	243.3	36.1	296	292.8	43.4
47	46.5	06.9	97	95.9	14.2	47	145.4	21.6	97	194.9	28.9	47	244.3	36.2	97	293.8	43.6
48	47.5	07.0	98	96.9	14.4	48	146.4	21.7	98	195.8	29.0	48	245.3	36.4	98	294.8	43.7
49	48.5	07.2	99	97.9	14.5	49	147.4	21.8	99	196.8	29.2	49	246.3	36.5	99	295.7	43.8
50	49.5	07.3	100	98.9	14.7	150	148.4	22.0	200	197.8	29.3	250	247.3	36.7	300	296.7	44.0
Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat

for  $7\frac{1}{4}$  Points.

# Difference of Latitude and Departure for 1 Point.

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Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	50.0	10.0	101	99.1	19.7	151	148.1	29.5	201	197.1	39.2	251	246.1	49.0
2	02.0	00.4	52	51.0	10.1	02	100.0	19.9	52	149.1	29.7	02	198.1	39.4	52	247.1	49.2
3	03.0	00.6	53	52.0	10.3	03	101.0	20.1	53	150.0	29.9	03	199.1	39.6	53	248.1	49.4
4	03.9	00.8	54	53.0	10.5	04	102.0	20.3	54	151.0	30.0	04	200.1	39.8	54	249.1	49.6
5	04.9	01.0	55	53.9	10.7	05	103.0	20.5	55	152.0	30.2	05	201.0	40.0	55	250.1	49.8
6	05.9	01.2	56	54.9	10.9	106	104.0	20.7	156	153.0	30.4	206	202.0	40.2	256	251.1	50.0
7	06.9	01.4	57	55.9	11.1	07	104.9	20.9	57	154.0	30.6	07	203.0	40.4	57	252.0	50.1
8	07.8	01.6	58	56.9	11.3	08	105.9	21.1	58	154.9	30.8	08	204.0	40.6	58	253.0	50.3
9	08.8	01.8	59	57.9	11.5	09	106.9	21.3	59	155.9	31.0	09	205.0	40.8	59	254.0	50.5
10	09.8	02.0	60	58.8	11.7	10	107.9	21.5	60	156.9	31.2	10	205.9	41.0	60	255.0	50.7
11	10.8	02.1	61	59.8	11.9	111	108.9	21.7	161	157.9	31.4	211	206.9	41.2	261	256.0	50.9
12	11.8	02.3	62	60.8	12.1	12	109.8	21.9	62	158.9	31.6	12	207.9	41.4	62	256.9	51.1
13	12.7	02.5	63	61.8	12.3	13	110.8	22.0	63	159.8	31.8	13	208.9	41.6	63	257.9	51.3
14	13.7	02.7	64	62.8	12.5	14	111.8	22.2	64	160.8	32.0	14	209.9	41.8	64	258.9	51.5
15	14.7	02.9	65	63.7	12.7	15	112.8	22.4	65	161.8	32.2	15	210.8	42.0	65	259.9	51.7
16	15.7	03.1	66	64.7	12.9	116	113.8	22.6	166	162.8	32.4	216	211.8	42.1	266	260.9	51.9
17	16.7	03.3	67	65.7	13.1	17	114.7	22.8	67	163.8	32.6	17	212.8	42.3	67	261.8	52.1
18	17.7	03.5	68	66.7	13.3	18	115.7	23.0	68	164.7	32.8	18	213.8	42.5	68	262.8	52.3
19	18.6	03.7	69	67.7	13.5	19	116.7	23.2	69	165.7	33.0	19	214.8	42.7	69	263.8	52.5
20	19.6	03.9	70	68.6	13.7	20	117.7	23.4	70	166.7	33.2	20	215.7	42.9	70	264.8	52.7
21	20.6	04.1	71	69.6	13.9	121	118.7	23.6	171	167.7	33.4	221	216.7	43.1	271	265.8	52.9
22	21.6	04.3	72	70.6	14.0	22	119.6	23.8	72	168.7	33.6	22	217.7	43.3	72	266.7	53.1
23	22.6	04.5	73	71.6	14.2	23	120.6	24.0	73	169.7	33.8	23	218.7	43.5	73	267.7	53.3
24	23.5	04.7	74	72.6	14.4	24	121.6	24.2	74	170.6	34.0	24	219.7	43.7	74	268.7	53.5
25	24.5	04.9	75	73.6	14.6	25	122.6	24.4	75	171.6	34.1	25	220.6	43.9	75	269.7	53.7
26	25.5	05.1	76	74.5	14.8	126	123.6	24.6	176	172.6	34.3	226	221.6	44.1	276	270.7	53.9
27	26.5	05.3	77	75.5	15.0	27	124.5	24.8	77	173.6	34.5	27	222.6	44.3	77	271.6	54.0
28	27.5	05.5	78	76.5	15.2	28	125.5	25.0	78	174.6	34.7	28	223.6	44.5	78	272.6	54.2
29	28.4	05.7	79	77.5	15.4	29	126.5	25.2	79	175.5	34.9	29	224.6	44.7	79	273.6	54.4
30	29.4	05.9	80	78.5	15.6	30	127.5	25.4	80	176.5	35.1	30	225.6	44.9	80	274.6	54.6
31	30.4	06.0	81	79.4	15.8	131	128.5	25.6	181	177.5	35.3	231	226.5	45.1	281	275.6	54.8
32	31.4	06.2	82	80.4	16.0	32	129.5	25.8	82	178.5	35.5	32	227.5	45.3	82	276.5	55.0
33	32.4	06.4	83	81.4	16.2	33	130.4	26.0	83	179.5	35.7	33	228.5	45.5	83	277.5	55.2
34	33.3	06.6	84	82.4	16.4	34	131.4	26.1	84	180.4	35.9	34	229.5	45.7	84	278.5	55.4
35	34.3	06.8	85	83.4	16.6	35	132.4	26.3	85	181.4	36.1	35	230.5	45.9	85	279.5	55.6
36	35.3	07.0	86	84.3	16.8	136	133.4	26.5	186	182.4	36.3	236	231.4	46.0	286	280.5	55.8
37	36.3	07.2	87	85.3	17.0	37	134.4	26.7	87	183.4	36.5	37	232.4	46.2	87	281.5	56.0
38	37.3	07.4	88	86.3	17.2	38	135.3	26.9	88	184.4	36.7	38	233.4	46.4	88	282.4	56.2
39	38.2	07.6	89	87.3	17.4	39	136.3	27.1	89	185.3	36.9	39	234.4	46.6	89	283.4	56.4
40	39.2	07.8	90	88.3	17.6	40	137.3	27.3	90	186.3	37.1	40	235.4	46.8	90	284.4	56.6
41	40.2	08.0	91	89.2	17.8	141	138.3	27.5	191	187.3	37.3	241	236.3	47.0	291	285.4	56.8
42	41.2	08.2	92	90.2	18.0	42	139.3	27.7	92	188.3	37.5	42	237.3	47.2	92	286.4	57.0
43	42.2	08.4	93	91.2	18.1	43	140.2	27.9	93	189.3	37.7	43	238.3	47.4	93	287.3	57.2
44	43.2	08.6	94	92.2	18.3	44	141.2	28.1	94	190.2	37.9	44	239.3	47.6	94	288.3	57.4
45	44.1	08.8	95	93.2	18.5	45	142.2	28.3	95	191.2	38.0	45	240.3	47.8	95	289.3	57.6
46	45.1	09.0	96	94.1	18.7	146	143.2	28.5	196	192.2	38.2	246	241.2	48.0	296	290.3	57.8
47	46.1	09.2	97	95.1	18.9	47	144.2	28.7	97	193.2	38.4	47	242.2	48.2	97	291.3	58.0
48	47.1	09.4	98	96.1	19.1	48	145.1	28.9	98	194.2	38.6	48	243.2	48.4	98	292.2	58.1
49	48.1	09.6	99	97.1	19.3	49	146.1	29.1	99	195.2	38.8	49	244.2	48.6	99	293.2	58.3
50	49.0	09.8	100	98.1	19.5	150	147.1	29.3	200	196.1	39.0	250	245.2	48.8	300	294.2	58.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 7 Points.



62 *Difference of Latitude and Departure for 1  $\frac{1}{4}$  Points.*

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	49.5	12.4	101	98.0	24.5	151	146.5	36.7	201	195.0	48.8	251	243.5	61.0
2	01.9	00.5	52	50.4	12.6	02	98.9	24.8	52	147.4	36.9	02	195.9	49.1	52	244.4	61.2
3	02.9	00.7	53	51.4	12.9	03	99.9	25.0	53	148.4	37.2	03	196.9	49.3	53	245.4	61.5
4	03.9	01.0	54	52.4	13.1	04	100.9	25.3	54	149.4	37.4	04	197.9	49.6	54	246.4	61.7
5	04.9	01.2	55	53.4	13.4	05	101.9	25.5	55	150.4	37.7	05	198.9	49.8	55	247.4	62.0
6	05.8	01.5	56	54.3	13.6	106	102.8	25.8	156	151.3	37.9	206	199.8	50.1	256	248.3	62.2
7	06.8	01.7	57	55.3	13.9	07	103.8	26.0	57	152.3	38.2	07	200.8	50.3	57	249.3	62.5
8	07.8	01.9	58	56.3	14.1	08	104.8	26.2	58	153.3	38.4	08	201.8	50.5	58	250.3	62.7
9	08.7	02.2	59	57.2	14.3	09	105.7	26.5	59	154.2	38.6	09	202.7	50.8	59	251.2	62.9
10	09.7	02.4	60	58.2	14.6	10	106.7	26.7	60	155.2	38.9	10	203.7	51.0	60	252.2	63.2
11	10.7	02.7	61	59.2	14.8	111	107.7	27.0	161	156.2	39.1	211	204.7	51.3	261	253.2	63.4
12	11.6	02.9	62	60.1	15.1	12	108.6	27.2	62	157.1	39.4	12	205.6	51.5	62	254.1	63.7
13	12.6	03.2	63	61.1	15.3	13	109.6	27.5	63	158.1	39.6	13	206.6	51.8	63	255.1	63.9
14	13.6	03.4	64	62.1	15.6	14	110.6	27.7	64	159.1	39.9	14	207.6	52.0	64	256.1	64.2
15	14.6	03.6	65	63.1	15.8	15	111.6	27.9	65	160.1	40.1	15	208.6	52.2	65	257.1	64.4
16	15.5	03.9	66	64.0	16.0	116	112.5	28.2	166	161.0	40.3	216	209.5	52.5	266	258.0	64.6
17	16.5	04.1	67	65.0	16.3	17	113.5	28.4	67	162.0	40.6	17	210.5	52.7	67	259.0	64.9
18	17.5	04.4	68	66.0	16.5	18	114.5	28.7	68	163.0	40.8	18	211.5	53.0	68	260.0	65.1
19	18.4	04.6	69	66.9	16.8	19	115.4	28.9	69	163.9	41.1	19	212.4	53.2	69	260.9	65.4
20	19.4	04.9	70	67.9	17.0	20	116.4	29.2	70	164.9	41.3	20	213.4	53.5	70	261.9	65.6
21	20.4	05.1	71	68.9	17.3	121	117.4	29.4	171	165.9	41.6	221	214.4	53.7	271	262.9	65.9
22	21.3	05.3	72	69.8	17.5	22	118.3	29.6	72	166.8	41.8	22	215.3	53.9	72	263.8	66.1
23	22.3	05.6	73	70.8	17.7	23	119.3	29.9	73	167.8	42.0	23	216.3	54.2	73	264.8	66.3
24	23.3	05.8	74	71.8	18.0	24	120.3	30.1	74	168.8	42.3	24	217.3	54.4	74	265.8	66.6
25	24.3	06.1	75	72.8	18.2	25	121.3	30.4	75	169.8	42.5	25	218.3	54.7	75	266.8	66.8
26	25.2	06.3	76	73.7	18.5	126	122.2	30.6	176	170.7	42.8	226	219.2	54.9	276	267.7	67.1
27	26.2	06.6	77	74.7	18.7	27	123.2	30.9	77	171.7	43.0	27	220.2	55.2	77	268.7	67.3
28	27.2	06.8	78	75.7	19.0	28	124.2	31.1	78	172.7	43.3	28	221.2	55.4	78	269.7	67.6
29	28.1	07.0	79	76.6	19.2	29	125.1	31.3	79	173.6	43.5	29	222.1	55.6	79	270.6	67.8
30	29.1	07.3	80	77.6	19.4	30	126.1	31.6	80	174.6	43.7	30	223.1	55.9	80	271.6	68.0
31	30.1	07.5	81	78.6	19.7	131	127.1	31.8	181	175.6	44.0	231	224.1	56.1	281	272.6	68.3
32	31.0	07.8	82	79.5	19.9	32	128.0	32.1	82	176.5	44.2	32	225.0	56.4	82	273.5	68.5
33	32.0	08.0	83	80.5	20.2	33	129.0	32.3	83	177.5	44.5	33	226.0	56.6	83	274.5	68.8
34	33.0	08.3	84	81.5	20.4	34	130.0	32.6	84	178.5	44.7	34	227.0	56.9	84	275.5	69.0
35	34.0	08.5	85	82.5	20.7	35	131.0	32.8	85	179.5	45.0	35	228.0	57.1	85	276.5	69.3
36	34.9	08.7	86	83.4	20.9	136	131.9	33.0	186	180.4	45.2	236	228.9	57.3	286	277.4	69.5
37	35.9	09.0	87	84.4	21.1	37	132.9	33.3	87	181.4	45.4	37	229.9	57.6	87	278.4	69.7
38	36.9	09.2	88	85.4	21.4	38	133.9	33.5	88	182.4	45.7	38	230.9	57.8	88	279.4	70.0
39	37.8	09.5	89	86.3	21.6	39	134.8	33.8	89	183.3	45.9	39	231.8	58.1	89	280.3	70.2
40	38.8	09.7	90	87.3	21.9	40	135.8	34.0	90	184.3	46.2	40	232.8	58.3	90	281.3	70.5
41	39.8	10.0	91	88.3	22.1	141	136.8	34.3	191	185.3	46.4	241	233.8	58.6	291	282.3	70.7
42	40.7	10.2	92	89.2	22.4	42	137.7	34.5	92	186.2	46.7	42	234.7	58.8	92	283.2	71.0
43	41.7	10.4	93	90.2	22.6	43	138.7	34.7	93	187.2	46.9	43	235.7	59.0	93	284.2	71.2
44	42.7	10.7	94	91.2	22.8	44	139.7	35.0	94	188.2	47.1	44	236.7	59.3	94	285.2	71.4
45	43.7	10.9	95	92.2	23.1	45	140.7	35.2	95	189.2	47.4	45	237.7	59.5	95	286.2	71.7
46	44.6	11.2	96	93.1	23.3	146	141.6	35.5	196	190.1	47.6	246	238.6	59.8	296	287.1	71.9
47	45.6	11.4	97	94.1	23.6	47	142.6	35.7	97	191.1	47.9	47	239.6	60.0	97	288.1	72.2
48	46.6	11.7	98	95.1	23.8	48	143.6	36.0	98	192.1	48.1	48	240.6	60.3	98	289.1	72.4
49	47.5	11.9	99	96.0	24.1	49	144.5	36.2	99	193.0	48.4	49	241.5	60.5	99	290.0	72.7
50	48.5	12.2	100	97.0	24.3	150	145.5	36.5	200	194.0	48.6	250	242.5	60.7	300	291.0	72.9
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

*for 6  $\frac{1}{4}$  Points.*

# *Difference of Latitude and Departure for 1½ Point. 63*

Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep
1	01.0	00.3	51	48.8	14.8	101	96.7	29.3	151	144.5	43.8	201	192.4	58.3	251	240.2	72.8
2	01.9	00.6	52	49.8	15.1	02	97.6	29.6	52	145.5	44.1	02	193.3	58.6	52	241.2	73.1
3	02.9	00.9	53	50.7	15.4	03	98.6	29.9	53	146.4	44.4	03	194.3	58.9	53	242.1	73.4
4	03.8	01.2	54	51.7	15.7	04	99.5	30.2	54	147.4	44.7	04	195.2	59.2	54	243.1	73.7
5	04.8	01.5	55	52.6	16.0	05	100.5	30.5	55	148.3	45.0	05	196.2	59.5	55	244.0	74.0
6	05.7	01.7	56	53.6	16.2	106	101.4	30.7	156	149.3	45.2	206	197.1	59.7	256	245.0	74.2
7	06.7	02.0	57	54.5	16.5	07	102.4	31.0	57	150.2	45.5	07	198.1	60.0	57	245.9	74.5
8	07.7	02.3	58	55.5	16.8	08	103.4	31.3	58	151.2	45.8	08	199.1	60.3	58	246.9	74.8
9	08.6	02.6	59	56.5	17.1	09	104.3	31.6	59	152.2	46.1	09	200.0	60.6	59	247.9	75.1
10	09.6	02.9	60	57.4	17.4	10	105.3	31.9	60	153.1	46.4	10	201.0	60.9	60	248.8	75.4
11	10.5	03.2	61	58.4	17.7	111	106.2	32.2	161	154.1	46.7	211	201.9	61.2	261	249.8	75.7
12	11.5	03.5	62	59.3	18.0	12	107.2	32.5	62	155.0	47.0	12	202.9	61.5	62	250.7	76.0
13	12.4	03.8	63	60.3	18.3	13	108.1	32.8	63	156.0	47.3	13	203.8	61.8	63	251.7	76.3
14	13.4	04.1	64	61.2	18.6	14	109.1	33.1	64	156.9	47.6	14	204.8	62.1	64	252.6	76.6
15	14.4	04.4	65	62.2	18.9	15	110.1	33.4	65	157.9	47.9	15	205.8	62.4	65	253.6	76.9
16	15.3	04.6	66	63.2	19.1	116	111.0	33.6	166	158.9	48.1	216	206.7	62.6	266	254.6	77.1
17	16.3	04.9	67	64.1	19.4	17	112.0	33.9	67	159.8	48.4	17	207.7	62.9	67	255.5	77.4
18	17.2	05.2	68	65.1	19.7	18	112.9	34.2	68	160.8	48.7	18	208.6	63.2	68	256.5	77.7
19	18.2	05.5	69	66.0	20.0	19	113.9	34.5	69	161.7	49.0	19	209.6	63.5	69	257.4	78.0
20	19.1	05.8	70	67.0	20.3	20	114.8	34.8	70	162.7	49.3	20	210.5	63.8	70	258.4	78.3
21	20.1	06.1	71	67.9	20.6	121	115.8	35.1	171	163.6	49.6	221	211.5	64.1	271	259.3	78.6
22	21.1	06.4	72	68.9	20.9	22	116.8	35.4	72	164.6	49.9	22	212.5	64.4	72	260.3	78.9
23	22.0	06.7	73	69.9	21.2	23	117.7	35.7	73	165.6	50.2	23	213.4	64.7	73	261.3	79.2
24	23.0	07.0	74	70.8	21.5	24	118.7	36.0	74	166.5	50.5	24	214.4	65.0	74	262.2	79.5
25	23.9	07.3	75	71.8	21.8	25	119.6	36.3	75	167.5	50.8	25	215.3	65.3	75	263.2	79.8
26	24.9	07.5	76	72.7	22.0	126	120.6	36.5	176	168.4	51.0	226	216.3	65.5	276	264.1	80.0
27	25.8	07.8	77	73.7	22.3	27	121.5	36.8	77	169.4	51.3	27	217.2	65.8	77	265.1	80.3
28	26.8	08.1	78	74.6	22.6	28	122.5	37.1	78	170.3	51.6	28	218.2	66.1	78	266.0	80.6
29	27.8	08.4	79	75.6	22.9	29	123.5	37.4	79	171.3	51.9	29	219.2	66.4	79	267.0	80.9
30	28.7	08.7	80	76.6	23.2	30	124.4	37.7	80	172.3	52.2	30	220.1	66.7	80	268.0	81.2
31	29.7	09.0	81	77.5	23.5	131	125.4	38.0	181	173.2	52.5	231	221.1	67.0	281	268.9	81.5
32	30.6	09.3	82	78.5	23.8	32	126.3	38.3	82	174.2	52.8	32	222.0	67.3	82	269.9	81.8
33	31.6	09.6	83	79.4	24.1	33	127.3	38.6	83	175.1	53.1	33	223.0	67.6	83	270.8	82.1
34	32.5	09.9	84	80.4	24.4	34	128.2	38.9	84	176.1	53.4	34	223.9	67.9	84	271.8	82.4
35	33.5	10.2	85	81.3	24.7	35	129.2	39.2	85	177.0	53.7	35	224.9	68.2	85	272.7	82.7
36	34.5	10.4	86	82.3	24.9	136	130.2	39.4	186	178.0	53.9	236	225.9	68.4	286	273.7	82.9
37	35.4	10.7	87	83.3	25.2	37	131.1	39.7	87	179.0	54.2	37	226.8	68.7	87	274.7	83.2
38	36.4	11.0	88	84.2	25.5	38	132.1	40.0	88	179.9	54.5	38	227.8	69.0	88	275.6	83.5
39	37.3	11.3	89	85.2	25.8	39	133.0	40.3	89	180.9	54.8	39	228.7	69.3	89	276.6	83.8
40	38.3	11.6	90	86.1	26.1	40	134.0	40.6	90	181.8	55.1	40	229.7	69.6	90	277.5	84.1
41	39.2	11.9	91	87.1	26.4	141	134.9	40.9	191	182.8	55.4	241	230.6	69.9	291	278.5	84.4
42	40.2	12.2	92	88.0	26.7	42	135.9	41.2	92	183.7	55.7	42	231.6	70.2	92	279.4	84.7
43	41.2	12.5	93	89.0	27.0	43	136.9	41.5	93	184.7	56.0	43	232.5	70.5	93	280.4	85.0
44	42.1	12.8	94	90.0	27.3	44	137.8	41.8	94	185.7	56.3	44	233.5	70.8	94	281.4	85.3
45	43.1	13.1	95	90.9	27.6	45	138.8	42.1	95	186.6	56.6	45	234.5	71.0	95	282.3	85.6
46	44.0	13.3	96	91.9	27.8	146	139.7	42.3	196	187.6	56.8	246	235.4	71.3	296	283.3	85.8
47	45.0	13.6	97	92.8	28.1	47	140.7	42.6	97	188.5	57.1	47	236.4	71.6	97	284.2	86.1
48	45.9	13.9	98	93.8	28.4	48	141.6	42.9	98	189.5	57.4	48	237.3	71.9	98	285.2	86.4
49	46.9	14.2	99	94.7	28.7	49	142.6	43.2	99	190.4	57.7	49	238.3	72.2	99	286.1	86.7
50	47.9	14.5	100	95.7	29.0	150	143.5	43.5	200	191.4	58.0	250	239.2	72.5	300	287.1	87.0
Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat

*for 6 ½ Points.*



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.3	51	48.0	17.2	101	95.1	34.0	151	142.2	50.9	201	189.2	67.7	251	236.3	84.5
2	01.9	00.7	52	49.0	17.5	02	96.0	34.4	52	143.1	51.2	02	190.2	68.0	52	237.3	84.9
3	02.8	01.0	53	49.9	17.9	03	97.0	34.7	53	144.0	51.5	03	191.1	68.4	53	238.2	85.2
4	03.8	01.3	54	50.8	18.2	04	97.9	35.0	54	145.0	51.9	04	192.1	68.7	54	239.1	85.5
5	04.7	01.7	55	51.8	18.5	05	98.9	35.4	55	145.9	52.2	05	193.0	69.0	55	240.1	85.9
6	05.6	02.0	56	52.7	18.9	106	99.8	35.7	156	146.9	52.5	206	194.0	69.4	256	241.0	86.2
7	06.6	02.4	57	53.7	19.2	07	100.7	36.0	57	147.8	52.9	07	194.9	69.7	57	242.0	86.6
8	07.5	02.7	58	54.6	19.5	08	101.7	36.4	58	148.8	53.2	08	195.8	70.1	58	242.9	86.9
9	08.5	03.0	59	55.5	19.9	09	102.6	36.7	59	149.7	53.6	09	196.8	70.4	59	243.8	87.2
10	09.4	03.4	60	56.5	20.2	10	103.6	37.0	60	150.6	53.9	10	197.7	70.7	60	244.8	87.6
11	10.4	03.7	61	57.4	20.5	111	104.5	37.4	161	151.6	54.2	211	198.7	71.1	261	245.7	87.9
12	11.3	04.0	62	58.4	20.9	12	105.4	37.7	62	152.5	54.6	12	199.6	71.4	62	246.7	88.2
13	12.2	04.4	63	59.3	21.2	13	106.4	38.1	63	153.5	54.9	13	200.5	71.7	63	247.6	88.6
14	13.2	04.7	64	60.3	21.6	14	107.3	38.4	64	154.4	55.2	14	201.5	72.1	64	248.6	88.9
15	14.1	05.1	65	61.2	21.9	15	108.3	38.7	65	155.3	55.6	15	202.4	72.4	65	249.5	89.2
16	15.1	05.4	66	62.1	22.2	116	109.2	39.1	166	156.3	55.9	216	203.4	72.7	266	250.4	89.6
17	16.0	05.7	67	63.1	22.6	17	110.2	39.4	67	157.2	56.2	17	204.3	73.1	67	251.4	89.9
18	17.0	06.1	68	64.0	22.9	18	111.1	39.7	68	158.2	56.6	18	205.2	73.4	68	252.3	90.3
19	17.9	06.4	69	65.0	23.2	19	112.0	40.1	69	159.1	56.9	19	206.2	73.8	69	253.3	90.6
20	18.8	06.7	70	65.9	23.6	20	113.0	40.4	70	160.1	57.3	20	207.1	74.1	70	254.2	90.9
21	19.8	07.1	71	66.8	23.9	121	113.9	40.8	171	161.0	57.6	221	208.1	74.4	271	255.1	91.3
22	20.7	07.4	72	67.8	24.2	22	114.9	41.1	72	161.9	57.9	22	209.0	74.8	72	256.1	91.6
23	21.7	07.7	73	68.7	24.6	23	115.8	41.4	73	162.9	58.3	23	210.0	75.1	73	257.0	91.9
24	22.6	08.1	74	69.7	24.9	24	116.7	41.8	74	163.8	58.6	24	210.9	75.4	74	258.0	92.3
25	23.5	08.4	75	70.6	25.3	25	117.7	42.1	75	164.8	58.9	25	211.8	75.8	75	258.9	92.6
26	24.5	08.8	76	71.6	25.6	126	118.6	42.4	176	165.7	59.3	226	212.8	76.1	276	259.9	93.0
27	25.4	09.1	77	72.5	25.9	27	119.6	42.8	77	166.6	59.6	27	213.7	76.5	77	260.8	93.3
28	26.4	09.4	78	73.4	26.3	28	120.5	43.1	78	167.6	60.0	28	214.7	76.8	78	261.7	93.6
29	27.3	09.8	79	74.4	26.6	29	121.5	43.4	79	168.5	60.3	29	215.6	77.1	79	262.7	94.0
30	28.2	10.1	80	75.3	26.9	30	122.4	43.8	80	169.5	60.6	30	216.5	77.5	80	263.6	94.3
31	29.2	10.4	81	76.3	27.3	131	123.3	44.1	181	170.4	61.0	231	217.5	77.8	281	264.6	94.6
32	30.1	10.8	82	77.2	27.6	32	124.3	44.5	82	171.4	61.3	32	218.4	78.1	82	265.5	95.0
33	31.1	11.1	83	78.1	28.0	33	125.2	44.8	83	172.3	61.6	33	219.4	78.5	83	266.4	95.3
34	32.0	11.5	84	79.1	28.3	34	126.2	45.1	84	173.2	62.0	34	220.3	78.8	84	267.4	95.6
35	33.0	11.8	85	80.0	28.6	35	127.1	45.5	85	174.2	62.3	35	221.3	79.1	85	268.3	96.0
36	33.9	12.1	86	81.0	29.0	136	128.0	45.8	186	175.1	62.6	236	222.2	79.5	286	269.3	96.3
37	34.8	12.5	87	81.9	29.3	37	129.0	46.1	87	176.1	63.0	37	223.1	79.8	87	270.2	96.7
38	35.8	12.8	88	82.9	29.6	38	129.9	46.5	88	177.0	63.3	38	224.1	80.2	88	271.2	97.0
39	36.7	13.1	89	83.8	30.0	39	130.9	46.8	89	177.9	63.7	39	225.0	80.5	89	272.1	97.3
40	37.7	13.5	90	84.7	30.3	40	131.8	47.2	90	178.9	64.0	40	226.0	80.8	90	273.0	97.7
41	38.6	13.8	91	85.7	30.6	141	132.8	47.5	191	179.8	64.3	241	226.9	81.2	291	274.0	98.0
42	39.5	14.1	92	86.6	31.0	42	133.7	47.8	92	180.8	64.7	42	227.8	81.5	92	274.9	98.3
43	40.5	14.5	93	87.6	31.3	43	134.6	48.2	93	181.7	65.0	43	228.8	81.8	93	275.9	98.7
44	41.4	14.8	94	88.5	31.7	44	135.6	48.5	94	182.6	65.3	44	229.7	82.2	94	276.8	99.0
45	42.4	15.2	95	89.4	32.0	45	136.5	48.8	95	183.6	65.7	45	230.7	82.5	95	277.7	99.4
46	43.3	15.5	96	90.4	32.3	146	137.5	49.2	196	184.5	66.0	246	231.6	82.9	296	278.7	99.7
47	44.3	15.8	97	91.3	32.7	47	138.4	49.5	97	185.5	66.3	47	232.5	83.2	97	279.6	100.0
48	45.2	16.2	98	92.3	33.0	48	139.3	49.8	98	186.4	66.7	48	233.5	83.5	98	280.6	100.4
49	46.1	16.5	99	93.2	33.3	49	140.3	50.2	99	187.4	67.0	49	234.4	83.9	99	281.5	100.7
50	47.1	16.8	100	94.2	33.7	150	141.2	50.5	200	188.3	67.4	250	235.4	84.2	300	282.5	101.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $6 \frac{1}{4}$  Points

# Difference of Latitude and Departure for 2 Points.

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Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.4	51	47.1	19.5	101	93.3	38.7	151	139.5	57.8	201	185.7	76.9	251	231.9	96.1
2	01.8	00.8	52	48.0	19.9	02	94.2	39.0	52	140.4	58.2	02	186.6	77.3	52	232.8	96.4
3	02.8	01.1	53	49.0	20.3	03	95.2	39.4	53	141.4	58.6	03	187.6	77.7	53	233.8	96.8
4	03.7	01.5	54	49.9	20.7	04	96.1	39.8	54	142.3	58.9	04	188.5	78.1	54	234.7	97.2
5	04.6	01.9	55	50.8	21.0	05	97.0	40.2	55	143.2	59.3	05	189.4	78.5	55	235.6	97.6
6	05.5	02.3	56	51.7	21.4	106	97.9	40.6	156	144.1	59.7	206	190.3	78.8	256	236.5	98.0
7	06.5	02.7	57	52.7	21.8	07	98.9	41.0	57	145.1	60.1	07	191.3	79.2	57	237.5	98.4
8	07.4	03.1	58	53.6	22.2	08	99.8	41.3	58	146.0	60.5	08	192.2	79.6	58	238.4	98.7
9	08.3	03.4	59	54.5	22.6	09	100.7	41.7	59	146.9	60.9	09	193.1	80.0	59	239.3	99.1
10	09.2	03.8	60	55.4	23.0	10	101.6	42.1	60	147.8	61.2	10	194.0	80.4	60	240.2	99.5
11	10.2	04.2	61	56.4	23.3	111	102.6	42.5	161	148.8	61.6	211	194.9	80.8	261	241.1	99.9
12	11.1	04.6	62	57.3	23.7	12	103.5	42.9	62	149.7	62.0	12	195.9	81.1	62	242.1	100.3
13	12.0	05.0	63	58.2	24.1	13	104.4	43.2	63	150.6	62.4	13	196.8	81.5	63	243.0	100.7
14	12.9	05.4	64	59.1	24.5	14	105.3	43.6	64	151.5	62.8	14	197.7	81.9	64	243.9	101.0
15	13.9	05.7	65	60.1	24.9	15	106.3	44.0	65	152.5	63.1	15	198.6	82.3	65	244.8	101.4
16	14.8	06.1	66	61.0	25.3	116	107.2	44.4	166	153.4	63.5	216	199.6	82.7	266	245.8	101.8
17	15.7	06.5	67	61.9	25.6	17	108.1	44.8	67	154.3	63.9	17	200.5	83.0	67	246.7	102.2
18	16.6	06.9	68	62.8	26.0	18	109.0	45.2	68	155.2	64.3	18	201.4	83.4	68	247.6	102.6
19	17.6	07.3	69	63.8	26.4	19	109.9	45.5	69	156.1	64.7	19	202.3	83.8	69	248.5	103.0
20	18.5	07.7	70	64.7	26.8	20	110.9	45.9	70	157.1	65.1	20	203.3	84.2	70	249.5	103.3
21	19.4	08.0	71	65.6	27.2	121	111.8	46.3	171	158.0	65.4	221	204.2	84.6	271	250.4	103.7
22	20.3	08.4	72	66.5	27.6	22	112.7	46.7	72	158.9	65.8	22	205.1	85.0	72	251.3	104.1
23	21.3	08.8	73	67.5	27.9	23	113.6	47.1	73	159.8	66.2	23	206.0	85.3	73	252.2	104.5
24	22.2	09.2	74	68.4	28.3	24	114.6	47.5	74	160.8	66.6	24	207.0	85.7	74	253.2	104.9
25	23.1	09.6	75	69.3	28.7	25	115.5	47.8	75	161.7	67.0	25	207.9	86.1	75	254.1	105.2
26	24.0	10.0	76	70.2	29.1	126	116.4	48.2	176	162.6	67.4	226	208.8	86.5	276	255.0	105.6
27	24.9	10.3	77	71.1	29.5	27	117.3	48.6	77	163.5	67.7	27	209.7	86.9	77	255.9	106.0
28	25.9	10.7	78	72.1	29.9	28	118.3	49.0	78	164.5	68.1	28	210.7	87.3	78	256.9	106.4
29	26.8	11.1	79	73.0	30.2	29	119.2	49.4	79	165.4	68.5	29	211.6	87.6	79	257.8	106.8
30	27.7	11.5	80	73.9	30.6	30	120.1	49.8	80	166.3	68.9	30	212.5	88.0	80	258.7	107.2
31	28.6	11.9	81	74.8	31.0	131	121.0	50.1	181	167.2	69.3	231	213.4	88.4	281	259.6	107.5
32	29.6	12.2	82	75.8	31.4	32	122.0	50.5	82	168.2	69.7	32	214.4	88.8	82	260.6	107.9
33	30.5	12.6	83	76.7	31.8	33	122.9	50.9	83	169.1	70.0	33	215.3	89.2	83	261.5	108.3
34	31.4	13.0	84	77.6	32.1	34	123.8	51.3	84	170.0	70.4	34	216.2	89.6	84	262.4	108.7
35	32.3	13.4	85	78.5	32.5	35	124.7	51.7	85	170.9	70.8	35	217.1	89.9	85	263.3	109.1
36	33.3	13.8	86	79.5	32.9	136	125.7	52.0	186	171.9	71.2	236	218.0	90.3	286	264.2	109.5
37	34.2	14.2	87	80.4	33.3	37	126.6	52.4	87	172.8	71.6	37	219.0	90.7	87	265.2	109.8
38	35.1	14.5	88	81.3	33.7	38	127.5	52.8	88	173.7	72.0	38	219.9	91.1	88	266.1	110.2
39	36.0	14.9	89	82.2	34.1	39	128.4	53.2	89	174.6	72.3	39	220.8	91.5	89	267.0	110.6
40	37.0	15.3	90	83.2	34.4	40	129.4	53.6	90	175.6	72.7	40	221.7	91.9	90	267.9	111.0
41	37.9	15.7	91	84.1	34.8	141	130.3	54.0	191	176.5	73.1	241	222.7	92.2	291	268.9	111.4
42	38.8	16.1	92	85.0	35.2	42	131.2	54.3	92	177.4	73.5	42	223.6	92.6	92	269.8	111.8
43	39.7	16.5	93	85.9	35.6	43	132.1	54.7	93	178.3	73.9	43	224.5	93.0	93	270.7	112.1
44	40.6	16.8	94	86.9	36.0	44	133.0	55.1	94	179.2	74.2	44	225.4	93.4	94	271.6	112.5
45	41.6	17.2	95	87.8	36.4	45	134.0	55.5	95	180.2	74.6	45	226.4	93.8	95	272.6	112.9
46	42.5	17.6	96	88.7	36.7	146	134.9	55.9	196	181.1	75.0	246	227.3	94.1	296	273.5	113.3
47	43.4	18.0	97	89.6	37.1	47	135.8	56.3	97	182.0	75.4	47	228.2	94.5	97	274.4	113.7
48	44.4	18.4	98	90.6	37.5	48	136.7	56.6	98	182.9	75.8	48	229.1	94.9	98	275.3	114.0
49	45.3	18.8	99	91.5	37.9	49	137.7	57.0	99	183.9	76.2	49	230.1	95.3	99	276.3	114.4
50	46.2	19.1	100	92.4	38.3	150	138.6	57.4	200	184.8	76.5	250	231.0	95.7	300	277.2	114.8
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 6 Points.



Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep
1	00.9	00.4	51	46.1	21.8	101	91.3	43.2	151	136.5	64.6	201	181.7	85.9	251	226.9	107.3
2	01.8	00.9	52	47.0	22.2	02	92.2	43.6	52	137.4	65.0	02	182.6	86.4	52	227.8	107.8
3	02.7	01.3	53	47.9	22.7	03	93.1	44.0	53	138.3	65.4	03	183.5	86.8	53	228.7	108.2
4	03.6	01.7	54	48.8	23.1	04	94.0	44.5	54	139.2	65.8	04	184.4	87.2	54	229.6	108.6
5	04.5	02.1	55	49.7	23.5	05	94.9	44.9	55	140.1	66.3	05	185.3	87.7	55	230.5	109.0
6	05.4	02.6	56	50.6	23.9	106	95.8	45.3	156	141.0	66.7	206	186.2	88.1	256	231.4	109.5
7	06.3	03.0	57	51.5	24.4	07	96.7	45.8	57	141.9	67.1	07	187.1	88.5	57	232.3	109.9
8	07.2	03.4	58	52.4	24.8	08	97.6	46.2	58	142.8	67.6	08	188.0	88.9	58	233.2	110.3
9	08.1	03.8	59	53.3	25.2	09	98.5	46.6	59	143.7	68.0	09	188.9	89.4	59	234.1	110.7
10	09.0	04.3	60	54.2	25.7	10	99.4	47.0	60	144.6	68.4	10	189.8	89.8	60	235.0	111.2
11	09.9	04.7	61	55.1	26.1	111	100.3	47.5	161	145.5	68.8	211	190.7	90.2	261	235.9	111.6
12	10.8	05.1	62	56.0	26.5	12	101.2	47.9	62	146.4	69.3	12	191.6	90.6	62	236.8	112.0
13	11.8	05.6	63	57.0	26.9	13	102.1	48.3	63	147.3	69.7	13	192.5	91.1	63	237.7	112.5
14	12.7	06.0	64	57.9	27.4	14	103.0	48.7	64	148.2	70.1	14	193.4	91.5	64	238.6	112.9
15	13.6	06.4	65	58.8	27.8	15	103.9	49.2	65	149.1	70.6	15	194.3	91.9	65	239.5	113.3
16	14.5	06.8	66	59.7	28.2	116	104.8	49.6	166	150.0	71.0	216	195.2	92.4	266	240.4	113.7
17	15.4	07.3	67	60.6	28.6	17	105.8	50.0	67	151.0	71.4	17	196.1	92.8	67	241.3	114.2
18	16.3	07.7	68	61.5	29.1	18	106.7	50.5	68	151.9	71.8	18	197.0	93.2	68	242.2	114.6
19	17.2	08.1	69	62.4	29.5	19	107.6	50.9	69	152.8	72.3	19	197.9	93.6	69	243.1	115.0
20	18.1	08.6	70	63.3	29.9	20	108.5	51.3	70	153.7	72.7	20	198.8	94.1	70	244.0	115.5
21	19.0	09.0	71	64.2	30.4	121	109.4	51.7	171	154.6	73.1	221	199.8	94.5	271	245.0	115.9
22	19.9	09.4	72	65.1	30.8	22	110.3	52.2	72	155.5	73.5	22	200.7	94.9	72	245.9	116.3
23	20.8	09.8	73	66.0	31.2	23	111.2	52.6	73	156.4	74.0	23	201.6	95.4	73	246.8	116.7
24	21.7	10.3	74	66.9	31.6	24	112.1	53.0	74	157.3	74.4	24	202.5	95.8	74	247.7	117.2
25	22.6	10.7	75	67.8	32.1	25	113.0	53.5	75	158.2	74.8	25	203.4	96.2	75	248.6	117.6
26	23.5	11.1	76	68.7	32.5	126	113.9	53.9	176	159.1	75.3	226	204.3	96.6	276	249.5	118.0
27	24.4	11.5	77	69.6	32.9	27	114.8	54.3	77	160.0	75.7	27	205.2	97.1	77	250.4	118.4
28	25.3	12.0	78	70.5	33.4	28	115.7	54.7	78	160.9	76.1	28	206.1	97.5	78	251.3	118.9
29	26.2	12.4	79	71.4	33.8	29	116.6	55.2	79	161.8	76.5	29	207.0	97.9	79	252.2	119.3
30	27.1	12.8	80	72.3	34.2	30	117.5	55.6	80	162.7	77.0	30	207.9	98.3	80	253.1	119.7
31	28.0	13.3	81	73.2	34.6	131	118.4	56.0	181	163.6	77.4	231	208.8	98.8	281	254.0	120.2
32	28.9	13.7	82	74.1	35.1	32	119.3	56.4	82	164.5	77.8	32	209.7	99.2	82	254.9	120.6
33	29.8	14.1	83	75.0	35.5	33	120.2	56.9	83	165.4	78.2	33	210.6	99.6	83	255.8	121.0
34	30.7	14.5	84	75.9	35.9	34	121.1	57.3	84	166.3	78.7	34	211.5	100.1	84	256.7	121.4
35	31.6	15.0	85	76.8	36.3	35	122.0	57.7	85	167.2	79.1	35	212.4	100.5	85	257.6	121.9
36	32.5	15.4	86	77.7	36.8	136	122.9	58.2	186	168.1	79.5	236	213.3	100.9	286	258.5	122.3
37	33.4	15.8	87	78.6	37.2	37	123.8	58.6	87	169.0	80.0	37	214.2	101.3	87	259.4	122.7
38	34.4	16.2	88	79.6	37.6	38	124.7	59.0	88	169.9	80.4	38	215.1	101.8	88	260.3	123.1
39	35.3	16.7	89	80.5	38.1	39	125.6	59.4	89	170.8	80.8	39	216.0	102.2	89	261.2	123.6
40	36.2	17.1	90	81.4	38.5	40	126.5	59.9	90	171.7	81.2	40	216.9	102.6	90	262.1	124.0
41	37.1	17.5	91	82.3	38.9	141	127.4	60.3	191	172.6	81.7	241	217.8	103.0	291	263.0	124.4
42	38.0	18.0	92	83.2	39.3	42	128.4	60.7	92	173.6	82.1	42	218.7	103.5	92	263.9	124.9
43	38.9	18.4	93	84.1	39.8	43	129.3	61.1	93	174.5	82.5	43	219.6	103.9	93	264.8	125.3
44	39.8	18.8	94	85.0	40.2	44	130.2	61.6	94	175.4	83.0	44	220.5	104.3	94	265.7	125.7
45	40.7	19.2	95	85.9	40.6	45	131.1	62.0	95	176.3	83.4	45	221.4	104.8	95	266.6	126.1
46	41.6	19.7	96	86.8	41.0	146	132.0	62.4	196	177.2	83.8	246	222.4	105.2	296	267.6	126.6
47	42.5	20.1	97	87.7	41.5	47	132.9	62.9	97	178.1	84.2	47	223.3	105.6	97	268.5	127.0
48	43.4	20.5	98	88.6	41.9	48	133.8	63.3	98	179.0	84.7	48	224.2	106.0	98	269.4	127.4
49	44.3	21.0	99	89.5	42.3	49	134.7	63.7	99	179.9	85.1	49	225.1	106.5	99	270.3	127.8
50	45.2	21.4	100	90.4	42.8	150	135.6	64.1	200	180.8	85.5	250	226.0	106.9	300	271.2	128.3
Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat

for  $5\frac{1}{4}$  Points.

# *Difference of Latitude and Departure for 2 $\frac{1}{2}$ Points.*

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Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.5	51	45.0	24.0	101	89.1	47.6	151	133.2	71.1	201	177.3	94.7	251	221.4	118.3
2	01.8	00.9	52	45.9	24.5	02	90.0	48.1	52	134.1	71.6	02	178.2	95.2	52	222.3	118.7
3	02.6	01.4	53	46.7	25.0	03	90.8	48.5	53	134.9	72.1	03	179.0	95.6	53	223.1	119.2
4	03.5	01.9	54	47.6	25.4	04	91.7	49.0	54	135.8	72.6	04	179.9	96.1	54	224.0	119.7
5	04.4	02.4	55	48.5	25.9	05	92.6	49.5	55	136.7	73.0	05	180.8	96.6	55	224.9	120.1
6	05.3	02.8	56	49.4	26.4	106	93.5	49.9	156	137.6	73.5	206	181.7	97.1	256	225.8	120.6
7	06.2	03.3	57	50.3	26.9	07	94.4	50.4	57	138.5	74.0	07	182.6	97.5	57	226.7	121.1
8	07.1	03.8	58	51.2	27.3	08	95.3	50.9	58	139.4	74.4	08	183.5	98.0	58	227.6	121.6
9	07.9	04.2	59	52.0	27.8	09	96.1	51.4	59	140.2	74.9	09	184.3	98.5	59	228.4	122.0
10	08.8	04.7	60	52.9	28.3	10	97.0	51.8	60	141.1	75.4	10	185.2	98.9	60	229.3	122.5
11	09.7	05.2	61	53.8	28.7	111	97.9	52.3	161	142.0	75.9	211	186.1	99.4	261	230.2	123.0
12	10.6	05.7	62	54.7	29.2	12	98.8	52.8	62	142.9	76.3	12	187.0	99.9	62	231.1	123.4
13	11.5	06.1	63	55.6	29.7	13	99.7	53.2	63	143.8	76.8	13	187.9	100.4	63	232.0	123.9
14	12.3	06.6	64	56.4	30.2	14	100.5	53.7	64	144.6	77.3	14	188.7	100.8	64	232.8	124.4
15	13.2	07.1	65	57.3	30.6	15	101.4	54.2	65	145.5	77.7	15	189.6	101.3	65	233.7	124.9
16	14.1	07.5	66	58.2	31.1	116	102.3	54.7	166	146.4	78.2	216	190.5	101.8	266	234.6	125.3
17	15.0	08.0	67	59.1	31.6	17	103.2	55.1	67	147.3	78.7	17	191.4	102.2	67	235.5	125.8
18	15.9	08.5	68	60.0	32.0	18	104.1	55.6	68	148.2	79.2	18	192.3	102.7	68	236.4	126.3
19	16.8	09.0	69	60.9	32.5	19	105.0	56.1	69	149.1	79.6	19	193.2	103.2	69	237.3	126.7
20	17.6	09.4	70	61.7	33.0	20	105.8	56.5	70	149.9	80.1	20	194.0	103.7	70	238.1	127.2
21	18.5	09.9	71	62.6	33.5	121	106.7	57.0	171	150.8	80.6	221	194.9	104.1	271	239.0	127.7
22	19.4	10.4	72	63.5	33.9	22	107.6	57.5	72	151.7	81.0	22	195.8	104.6	72	239.9	128.2
23	20.3	10.8	73	64.4	34.4	23	108.5	58.0	73	152.6	81.5	23	196.7	105.1	73	240.8	128.6
24	21.2	11.3	74	65.3	34.9	24	109.4	58.4	74	153.5	82.0	24	197.6	105.5	74	241.7	129.1
25	22.1	11.8	75	66.2	35.3	25	110.3	58.9	75	154.3	82.5	25	198.4	106.0	75	242.5	129.6
26	22.9	12.3	76	67.0	35.8	126	111.1	59.4	176	155.2	82.9	226	199.3	106.5	276	243.4	130.0
27	23.8	12.7	77	67.9	36.3	27	112.0	59.8	77	156.1	83.4	27	200.2	107.0	77	244.3	130.5
28	24.7	13.2	78	68.8	36.8	28	112.9	60.3	78	157.0	83.9	28	201.1	107.4	78	245.2	131.0
29	25.6	13.7	79	69.7	37.2	29	113.8	60.8	79	157.9	84.3	29	202.0	107.9	79	246.1	131.5
30	26.5	14.1	80	70.6	37.7	30	114.7	61.3	80	158.8	84.8	30	202.9	108.4	80	247.0	131.9
31	27.3	14.6	81	71.4	38.2	131	115.5	61.7	181	159.6	85.3	231	203.7	108.8	281	247.8	132.4
32	28.2	15.1	82	72.3	38.6	32	116.4	62.2	82	160.5	85.8	32	204.6	109.3	82	248.7	132.9
33	29.1	15.5	83	73.2	39.1	33	117.3	62.7	83	161.4	86.2	33	205.5	109.8	83	249.6	133.3
34	30.0	16.0	84	74.1	39.6	34	118.2	63.1	84	162.3	86.7	34	206.4	110.3	84	250.5	133.8
35	30.9	16.5	85	75.0	40.1	35	119.1	63.6	85	163.2	87.2	35	207.3	110.7	85	251.4	134.3
36	31.8	17.0	86	75.9	40.5	136	120.0	64.1	186	164.1	87.6	236	208.2	111.2	286	252.3	134.8
37	32.6	17.4	87	76.7	41.0	37	120.8	64.5	87	164.9	88.1	37	209.0	111.7	87	253.1	135.2
38	33.5	17.9	88	77.6	41.5	38	121.7	65.0	88	165.8	88.6	38	209.9	112.1	88	254.0	135.7
39	34.4	18.4	89	78.5	41.9	39	122.6	65.5	89	166.7	89.1	39	210.8	112.6	89	254.9	136.2
40	35.3	18.8	90	79.4	42.4	40	123.5	66.0	90	167.6	89.5	40	211.7	113.1	90	255.8	136.6
41	36.2	19.3	91	80.3	42.9	141	124.4	66.4	191	168.5	90.0	241	212.6	113.5	291	256.7	137.1
42	37.0	19.8	92	81.1	43.4	42	125.2	66.9	92	169.3	90.5	42	213.4	114.0	92	257.5	137.6
43	37.9	20.3	93	82.0	43.8	43	126.1	67.4	93	170.2	90.9	43	214.3	114.5	93	258.4	138.1
44	38.8	20.7	94	82.9	44.3	44	127.0	67.8	94	171.1	91.4	44	215.2	115.0	94	259.3	138.5
45	39.7	21.2	95	83.8	44.8	45	127.9	68.3	95	172.0	91.9	45	216.1	115.4	95	260.2	139.0
46	40.6	21.7	96	84.7	45.2	146	128.8	68.8	196	172.9	92.4	246	217.0	115.9	296	261.1	139.5
47	41.5	22.1	97	85.6	45.7	47	129.7	69.3	97	173.8	92.8	47	217.9	116.4	97	262.0	139.9
48	42.3	22.6	98	86.4	46.2	48	130.5	69.7	98	174.6	93.3	48	218.7	116.8	98	262.8	140.4
49	43.2	23.1	99	87.3	46.6	49	131.4	70.2	99	175.5	93.8	49	219.6	117.3	99	263.7	140.9
50	44.1	23.6	100	88.2	47.1	150	132.3	70.7	200	176.4	94.2	250	220.5	117.8	300	264.6	141.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

*for 5  $\frac{1}{2}$  Points.*



Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep
1	00.9	00.6	51	43.7	26.2	101	86.6	51.9	151	129.5	77.6	201	172.4	103.3	251	215.3	129.0
2	01.7	01.0	52	44.6	26.7	02	87.5	52.4	52	130.4	78.1	02	173.3	103.8	52	216.1	129.5
3	02.6	01.6	53	45.5	27.2	03	88.3	52.9	53	131.2	78.6	03	174.1	104.3	53	217.0	130.0
4	03.4	02.1	54	46.3	27.8	04	89.2	53.4	54	132.1	79.1	04	175.0	104.8	54	217.9	130.5
5	04.3	02.6	55	47.2	28.3	05	90.1	54.0	55	132.9	79.7	05	175.8	105.4	55	218.7	131.0
6	05.1	03.1	56	48.0	28.8	106	90.9	54.5	156	133.8	80.2	206	176.7	105.9	256	219.6	131.6
7	06.0	03.6	57	48.9	29.3	07	91.8	55.0	57	134.7	80.7	07	177.5	106.4	57	220.4	132.1
8	06.9	04.1	58	49.7	29.8	08	92.6	55.5	58	135.5	81.2	08	178.4	106.9	58	221.3	132.6
9	07.7	04.6	59	50.6	30.3	09	93.5	56.0	59	136.4	81.7	09	179.3	107.4	59	222.1	133.1
10	08.6	05.1	60	51.5	30.8	10	94.3	56.5	60	137.2	82.2	10	180.1	107.9	60	223.0	133.6
11	09.4	05.7	61	52.3	31.4	111	95.2	57.0	161	138.1	82.7	211	181.0	108.4	261	223.9	134.1
12	10.3	06.2	62	53.2	31.9	12	96.1	57.6	62	138.9	83.3	12	181.8	109.0	62	224.7	134.6
13	11.2	06.7	63	54.0	32.4	13	96.9	58.1	63	139.8	83.8	13	182.7	109.5	63	225.6	135.2
14	12.0	07.2	64	54.9	32.9	14	97.8	58.6	64	140.7	84.3	14	183.5	110.0	64	226.4	135.7
15	12.9	07.7	65	55.8	33.4	15	98.6	59.1	65	141.5	84.8	15	184.4	110.5	65	227.3	136.2
16	13.7	08.2	66	56.6	33.9	116	99.5	59.6	166	142.4	85.3	216	185.3	111.0	266	228.1	136.7
17	14.6	08.7	67	57.5	34.4	17	100.4	60.1	67	143.2	85.8	17	186.1	111.6	67	229.0	137.2
18	15.4	09.3	68	58.3	35.0	18	101.2	60.6	68	144.1	86.3	18	187.0	112.0	68	229.9	137.7
19	16.3	09.8	69	59.2	35.5	19	102.1	61.2	69	145.0	86.9	19	187.8	112.6	69	230.7	138.2
20	17.2	10.3	70	60.0	36.0	20	102.9	61.7	70	145.8	87.4	20	188.7	113.1	70	231.6	138.8
21	18.0	10.8	71	60.9	36.5	121	103.8	62.2	171	146.7	87.9	221	189.6	113.6	271	232.4	139.3
22	18.9	11.3	72	61.8	37.0	22	104.6	62.7	72	147.5	88.4	22	190.4	114.1	72	233.3	139.8
23	19.7	11.8	73	62.6	37.6	23	105.5	63.2	73	148.4	88.9	23	191.3	114.6	73	234.2	140.3
24	20.6	12.3	74	63.5	38.0	24	106.4	63.7	74	149.2	89.4	24	192.1	115.1	74	235.0	140.8
25	21.4	12.9	75	64.3	38.6	25	107.2	64.2	75	150.1	89.9	25	193.0	115.6	75	235.9	141.3
26	22.3	13.4	76	65.2	39.1	126	108.1	64.8	176	151.0	90.4	226	193.8	116.1	276	236.7	141.8
27	23.2	13.9	77	66.0	39.6	27	108.9	65.3	77	151.8	91.0	27	194.7	116.7	77	237.6	142.4
28	24.0	14.4	78	66.9	40.1	28	109.8	65.8	78	152.7	91.5	28	195.6	117.2	78	238.4	142.9
29	24.9	14.9	79	67.8	40.6	29	110.6	66.3	79	153.5	92.0	29	196.4	117.7	79	239.3	143.4
30	25.7	15.4	80	68.6	41.1	30	111.5	66.8	80	154.4	92.5	30	197.3	118.2	80	240.2	143.9
31	26.6	15.9	81	69.5	41.6	131	112.4	67.3	181	155.2	93.0	231	198.1	118.7	281	241.0	144.4
32	27.4	16.4	82	70.3	42.1	32	113.2	67.8	82	156.1	93.5	32	199.0	119.2	82	241.9	144.9
33	28.3	17.0	83	71.2	42.7	33	114.1	68.4	83	157.0	94.0	33	199.8	119.7	83	242.7	145.4
34	29.2	17.5	84	72.0	43.2	34	114.9	68.9	84	157.8	94.6	34	200.7	120.3	84	243.6	146.0
35	30.0	18.0	85	72.9	43.7	35	115.8	69.4	85	158.7	95.1	35	201.6	120.8	85	244.4	146.5
36	30.9	18.5	86	73.8	44.2	136	116.6	69.9	186	159.5	95.6	236	202.4	121.3	286	245.3	147.0
37	31.7	19.0	87	74.6	44.7	37	117.5	70.4	87	160.4	96.1	37	203.3	121.8	87	246.2	147.5
38	32.6	19.5	88	75.5	45.2	38	118.4	70.9	88	161.2	96.6	38	204.1	122.3	88	247.0	148.0
39	33.5	20.0	89	76.3	45.7	39	119.2	71.4	89	162.1	97.1	39	205.0	122.8	89	247.9	148.6
40	34.3	20.6	90	77.2	46.3	40	120.1	72.0	90	163.0	97.6	40	205.8	123.3	90	248.7	149.0
41	35.2	21.1	91	78.1	46.8	141	120.9	72.5	191	163.8	98.2	241	206.7	123.9	291	249.6	149.6
42	36.0	21.6	92	78.9	47.3	42	121.8	73.0	92	164.7	98.7	42	207.6	124.4	92	250.4	150.1
43	36.9	22.1	93	79.8	47.8	43	122.7	73.5	93	165.5	99.2	43	208.4	124.9	93	251.3	150.6
44	37.7	22.6	94	80.6	48.3	44	123.5	74.0	94	166.4	99.7	44	209.3	125.4	94	252.2	151.1
45	38.6	23.1	95	81.5	48.8	45	124.4	74.6	95	167.3	100.2	45	210.1	125.9	95	253.0	151.6
46	39.5	23.6	96	82.3	49.3	146	125.2	75.0	196	168.1	100.7	246	211.0	126.4	296	253.9	152.1
47	40.3	24.2	97	83.2	49.9	47	126.1	75.6	97	169.0	101.2	47	211.9	126.9	97	254.7	152.6
48	41.2	24.7	98	84.1	50.4	48	126.9	76.1	98	169.8	101.8	48	212.7	127.4	98	255.6	153.1
49	42.0	25.2	99	84.9	50.9	49	127.8	76.6	99	170.7	102.3	49	213.6	128.0	99	256.5	153.6
50	42.9	25.7	100	85.8	51.4	150	128.7	77.1	200	171.5	102.8	250	214.4	128.5	300	257.3	154.1
Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat

for  $5\frac{1}{4}$  Points.

# Difference of Latitude and Departure for 3 Points.

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Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	42.4	28.3	101	84.0	56.1	151	125.5	83.9	201	167.1	111.7	251	208.7	139.4
2	01.7	01.1	52	43.2	28.9	102	84.8	56.7	152	126.4	84.4	202	167.9	112.2	252	209.5	140.0
3	02.5	01.7	53	44.1	29.4	103	85.6	57.2	153	127.2	85.0	203	168.8	112.8	253	210.3	140.5
4	03.3	02.2	54	44.9	30.0	104	86.5	57.8	154	128.0	85.5	204	169.6	113.3	254	211.2	141.1
5	04.2	02.8	55	45.7	30.6	105	87.3	58.3	155	128.9	86.1	205	170.4	113.9	255	212.0	141.7
6	05.0	03.3	56	46.6	31.1	106	88.1	58.9	156	129.7	86.7	206	171.3	114.4	256	212.8	142.2
7	05.8	03.9	57	47.4	31.7	107	89.0	59.4	157	130.5	87.2	207	172.1	115.0	257	213.7	142.8
8	06.7	04.4	58	48.2	32.2	108	89.8	60.0	158	131.4	87.8	208	172.9	115.5	258	214.5	143.3
9	07.5	05.0	59	49.1	32.8	109	90.6	60.5	159	132.2	88.3	209	173.8	116.1	259	215.3	143.9
10	08.3	05.6	60	49.9	33.3	110	91.4	61.1	160	133.0	88.9	210	174.6	116.7	260	216.1	144.4
11	09.1	06.1	61	50.7	33.9	111	92.3	61.7	161	133.8	89.4	211	175.4	117.2	261	217.0	145.0
12	10.0	06.7	62	51.5	34.4	112	93.1	62.2	162	134.7	90.0	212	176.2	117.8	262	217.8	145.5
13	10.8	07.2	63	52.4	35.0	113	93.9	62.8	163	135.5	90.5	213	177.1	118.3	263	218.6	146.1
14	11.6	07.8	64	53.2	35.6	114	94.8	63.3	164	136.3	91.1	214	177.9	118.9	264	219.5	146.7
15	12.5	08.3	65	54.0	36.1	115	95.6	63.9	165	137.2	91.7	215	178.7	119.4	265	220.3	147.2
16	13.3	08.9	66	54.9	36.7	116	96.4	64.4	166	138.0	92.2	216	179.6	120.0	266	221.1	147.8
17	14.1	09.4	67	55.7	37.2	117	97.3	65.0	167	138.8	92.8	217	180.4	120.5	267	222.0	148.3
18	15.0	10.0	68	56.5	37.8	118	98.1	65.5	168	139.7	93.3	218	181.2	121.1	268	222.8	148.9
19	15.8	10.6	69	57.4	38.3	119	98.9	66.1	169	140.5	93.9	219	182.1	121.7	269	223.6	149.4
20	16.6	11.1	70	58.2	38.9	120	99.8	66.7	170	141.3	94.4	220	182.9	122.2	270	224.5	150.0
21	17.5	11.7	71	59.0	39.4	121	100.6	67.2	171	142.2	95.0	221	183.7	122.8	271	225.3	150.5
22	18.3	12.2	72	59.9	40.0	122	101.4	67.8	172	143.0	95.5	222	184.6	123.3	272	226.1	151.1
23	19.1	12.8	73	60.7	40.6	123	102.3	68.3	173	143.8	96.1	223	185.4	123.9	273	227.0	151.7
24	20.0	13.3	74	61.5	41.1	124	103.1	68.9	174	144.7	96.7	224	186.2	124.4	274	227.8	152.2
25	20.8	13.9	75	62.4	41.7	125	103.9	69.4	175	145.5	97.2	225	187.1	125.0	275	228.6	152.8
26	21.6	14.4	76	63.2	42.2	126	104.8	70.0	176	146.3	97.8	226	187.9	125.5	276	229.4	153.3
27	22.4	15.0	77	64.0	42.8	127	105.6	70.5	177	147.1	98.3	227	188.7	126.1	277	230.3	153.9
28	23.3	15.6	78	64.8	43.3	128	106.4	71.1	178	148.0	98.9	228	189.5	126.7	278	231.1	154.4
29	24.1	16.1	79	65.7	43.9	129	107.2	71.7	179	148.8	99.4	229	190.4	127.2	279	231.9	155.0
30	24.9	16.7	80	66.5	44.4	130	108.1	72.2	180	149.6	100.0	230	191.2	127.8	280	232.8	155.5
31	25.8	17.2	81	67.3	45.0	131	108.9	72.8	181	150.5	100.5	231	192.0	128.3	281	233.6	156.1
32	26.6	17.8	82	68.2	45.6	132	109.7	73.3	182	151.3	101.1	232	192.9	128.9	282	234.4	156.7
33	27.4	18.3	83	69.0	46.1	133	110.6	73.9	183	152.1	101.7	233	193.7	129.4	283	235.3	157.2
34	28.3	18.9	84	69.8	46.7	134	111.4	74.4	184	153.0	102.2	234	194.5	130.0	284	236.1	157.8
35	29.1	19.4	85	70.7	47.2	135	112.2	75.0	185	153.8	102.8	235	195.4	130.5	285	236.9	158.3
36	29.9	20.0	86	71.5	47.8	136	113.1	75.5	186	154.6	103.3	236	196.2	131.1	286	237.8	158.9
37	30.8	20.6	87	72.3	48.3	137	113.9	76.1	187	155.5	103.9	237	197.0	131.7	287	238.6	159.4
38	31.6	21.1	88	73.2	48.9	138	114.7	76.7	188	156.3	104.4	238	197.9	132.2	288	239.4	160.0
39	32.4	21.7	89	74.0	49.4	139	115.6	77.2	189	157.1	105.0	239	198.7	132.8	289	240.3	160.5
40	33.3	22.2	90	74.8	50.0	140	116.4	77.8	190	158.0	105.5	240	199.5	133.3	290	241.1	161.1
41	34.1	22.8	91	75.7	50.6	141	117.2	78.3	191	158.8	106.1	241	200.4	133.9	291	241.9	161.7
42	34.9	23.3	92	76.5	51.1	142	118.1	78.9	192	159.6	106.7	242	201.2	134.4	292	242.8	162.2
43	35.8	23.9	93	77.3	51.7	143	118.9	79.4	193	160.4	107.2	243	202.0	135.0	293	243.6	162.8
44	36.6	24.4	94	78.1	52.2	144	119.7	80.0	194	161.3	107.8	244	202.8	135.5	294	244.4	163.3
45	37.4	25.0	95	79.0	52.8	145	120.5	80.5	195	162.1	108.3	245	203.7	136.1	295	245.2	163.9
46	38.2	25.6	96	79.8	53.3	146	121.4	81.1	196	162.9	108.9	246	204.5	136.7	296	246.1	164.4
47	39.1	26.1	97	80.6	53.9	147	122.2	81.7	197	163.8	109.4	247	205.3	137.2	297	246.9	165.0
48	39.9	26.7	98	81.5	54.4	148	123.0	82.2	198	164.6	110.0	248	206.2	137.8	298	247.7	165.5
49	40.7	27.2	99	82.3	55.0	149	123.9	82.8	199	165.4	110.5	249	207.0	138.3	299	248.5	166.1
50	41.6	27.8	100	83.1	55.6	150	124.7	83.3	200	166.3	111.1	250	207.8	138.9	300	249.4	166.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 5 Points.



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	41.0	30.4	101	81.1	60.2	151	121.3	90.0	201	161.4	119.7	251	201.6	149.5
2	01.6	01.2	52	41.8	31.0	02	81.9	60.8	52	122.1	90.6	02	162.2	120.3	52	202.4	150.1
3	02.4	01.8	53	42.6	31.6	03	82.7	61.4	53	122.9	91.1	03	163.0	120.9	53	203.2	150.7
4	03.2	02.4	54	43.4	32.2	04	83.5	62.0	54	123.7	91.7	04	163.8	121.5	54	204.0	151.3
5	04.0	03.0	55	44.2	32.8	05	84.3	62.6	55	124.5	92.3	05	164.6	122.1	55	204.8	151.9
6	04.8	03.6	56	45.0	33.4	106	85.1	63.1	156	125.3	92.9	206	165.4	122.7	256	205.6	152.5
7	05.6	04.2	57	45.8	34.0	07	85.9	63.7	57	126.1	93.5	07	166.2	123.3	57	206.4	153.1
8	06.4	04.8	58	46.6	34.6	08	86.7	64.3	58	126.9	94.1	08	167.0	123.9	58	207.2	153.7
9	07.2	05.4	59	47.4	35.1	09	87.5	64.9	59	127.7	94.7	09	167.8	124.5	59	208.0	154.3
10	08.0	06.0	60	48.2	35.7	10	88.3	65.5	60	128.5	95.3	10	168.6	125.1	60	208.8	154.9
11	08.8	06.6	61	49.0	36.3	111	89.1	66.1	161	129.3	95.9	211	169.4	125.7	261	209.6	155.5
12	09.6	07.1	62	49.8	36.9	12	89.9	66.7	62	130.1	96.5	12	170.2	126.3	62	210.4	156.1
13	10.4	07.7	63	50.6	37.5	13	90.7	67.3	63	130.9	97.1	13	171.0	126.9	63	211.2	156.7
14	11.2	08.3	64	51.4	38.1	14	91.5	67.9	64	131.7	97.7	14	171.8	127.5	64	212.0	157.3
15	12.0	08.9	65	52.2	38.7	15	92.4	68.5	65	132.5	98.3	15	172.7	128.1	65	212.8	157.9
16	12.8	09.5	66	53.0	39.3	116	93.2	69.1	166	133.3	98.9	216	173.5	128.7	266	213.6	158.5
17	13.7	10.1	67	53.8	39.9	17	94.0	69.7	67	134.1	99.5	17	174.3	129.3	67	214.4	159.1
18	14.5	10.7	68	54.6	40.5	18	94.8	70.3	68	134.9	100.1	18	175.1	129.9	68	215.2	159.7
19	15.3	11.3	69	55.4	41.1	19	95.6	70.9	69	135.7	100.7	19	175.9	130.5	69	216.0	160.3
20	16.1	11.9	70	56.2	41.7	20	96.4	71.5	70	136.5	101.3	20	176.7	131.1	70	216.8	160.9
21	16.9	12.5	71	57.0	42.3	121	97.2	72.1	171	137.3	101.9	221	177.5	131.7	271	217.6	161.4
22	17.7	13.1	72	57.8	42.9	22	98.0	72.7	72	138.1	102.5	22	178.3	132.3	72	218.4	162.0
23	18.5	13.7	73	58.6	43.5	23	98.8	73.3	73	138.9	103.1	23	179.1	132.9	73	219.2	162.6
24	19.3	14.3	74	59.4	44.1	24	99.6	73.9	74	139.7	103.7	24	179.9	133.4	74	220.0	163.2
25	20.1	14.9	75	60.2	44.7	25	100.4	74.5	75	140.5	104.3	25	180.7	134.0	75	220.8	163.8
26	20.9	15.5	76	61.0	45.3	126	101.2	75.1	176	141.3	104.9	226	181.5	134.6	276	221.6	164.4
27	21.7	16.1	77	61.8	45.9	27	102.0	75.7	77	142.1	105.4	27	182.3	135.2	77	222.4	165.0
28	22.5	16.7	78	62.6	46.5	28	102.8	76.3	78	142.9	106.0	28	183.1	135.8	78	223.2	165.6
29	23.3	17.3	79	63.4	47.1	29	103.6	76.9	79	143.7	106.6	29	183.9	136.4	79	224.0	166.2
30	24.1	17.9	80	64.2	47.7	30	104.4	77.4	80	144.5	107.2	30	184.7	137.0	80	224.8	166.8
31	24.9	18.5	81	65.0	48.3	131	105.2	78.0	181	145.4	107.8	231	185.5	137.6	281	225.7	167.4
32	25.7	19.1	82	65.8	48.9	32	106.0	78.6	82	146.2	108.4	32	186.3	138.2	82	226.5	168.0
33	26.5	19.7	83	66.7	49.4	33	106.8	79.2	83	147.0	109.0	33	187.1	138.8	83	227.3	168.6
34	27.3	20.3	84	67.5	50.0	34	107.6	79.8	84	147.8	109.6	34	187.9	139.4	84	228.1	169.2
35	28.1	20.9	85	68.3	50.6	35	108.4	80.4	85	148.6	110.2	35	188.7	140.0	85	228.9	169.8
36	28.9	21.4	86	69.1	51.2	136	109.2	81.0	186	149.4	110.8	236	189.5	140.6	286	229.7	170.4
37	29.7	22.0	87	69.9	51.8	37	110.0	81.6	87	150.2	111.4	37	190.3	141.2	87	230.5	171.0
38	30.5	22.6	88	70.7	52.4	38	110.8	82.2	88	151.0	112.0	38	191.1	141.8	88	231.3	171.6
39	31.3	23.2	89	71.5	53.0	39	111.6	82.8	89	151.8	112.6	39	191.9	142.4	89	232.1	172.2
40	32.1	23.8	90	72.3	53.6	40	112.4	83.4	90	152.6	113.2	40	192.7	143.0	90	232.9	172.8
41	32.9	24.4	91	73.1	54.2	141	113.2	84.0	191	153.4	113.8	241	193.5	143.6	291	233.7	173.4
42	33.7	25.0	92	73.9	54.8	42	114.0	84.6	92	154.2	114.4	42	194.3	144.2	92	234.5	174.0
43	34.5	25.6	93	74.7	55.4	43	114.8	85.2	93	155.0	115.0	43	195.1	144.8	93	235.3	174.6
44	35.3	26.2	94	75.5	56.0	44	115.6	85.8	94	155.8	115.6	44	195.9	145.4	94	236.1	175.1
45	36.1	26.8	95	76.3	56.6	45	116.4	86.4	95	156.6	116.2	45	196.7	146.0	95	236.9	175.7
46	36.9	27.4	96	77.1	57.2	146	117.2	87.0	196	157.4	116.8	246	197.5	146.6	296	237.7	176.3
47	37.7	28.0	97	77.9	57.8	47	118.0	87.6	97	158.2	117.4	47	198.4	147.1	97	238.5	176.9
48	38.5	28.6	98	78.7	58.4	48	118.8	88.2	98	159.0	118.0	48	199.2	147.7	98	239.3	177.5
49	39.4	29.2	99	79.5	59.0	49	119.7	88.8	99	159.8	118.6	49	200.0	148.3	99	240.1	178.1
50	40.2	29.8	100	80.3	59.6	150	120.5	89.4	200	160.6	119.1	250	200.8	148.9	300	240.9	178.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $4\frac{1}{4}$  Points.

# *Difference of Latitude and Departure for 3 $\frac{1}{2}$ Points.*

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Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.8	00.6	51	39.4	32.3	101	78.1	64.0	151	116.7	95.8	201	155.3	127.5	251	194.0	159.2
2	01.5	01.3	52	40.2	33.0	02	78.8	64.7	52	117.5	96.4	02	156.1	128.1	52	194.7	159.8
3	02.3	01.9	53	41.0	33.6	03	79.6	65.3	53	118.2	97.0	03	156.9	128.7	53	195.5	160.4
4	03.1	02.5	54	41.7	34.2	04	80.4	66.0	54	119.0	97.7	04	157.6	129.4	54	196.3	161.1
5	03.9	03.2	55	42.5	34.9	05	81.1	66.6	55	119.8	98.3	05	158.4	130.0	55	197.1	161.7
6	04.6	03.8	56	43.3	35.5	106	81.9	67.2	156	120.6	98.9	206	159.2	130.6	256	197.8	162.3
7	05.4	04.4	57	44.1	36.1	07	82.7	67.9	57	121.3	99.6	07	160.0	131.3	57	198.6	163.0
8	06.2	05.1	58	44.8	36.8	08	83.5	68.5	58	122.1	100.2	08	160.7	131.9	58	199.4	163.6
9	07.0	05.7	59	45.6	37.4	09	84.2	69.1	59	122.9	100.8	09	161.5	132.5	59	200.1	164.2
10	07.7	06.3	60	46.4	38.0	10	85.0	69.8	60	123.6	101.5	10	162.3	133.2	60	200.9	164.9
11	08.5	07.0	61	47.1	38.7	111	85.8	70.4	161	124.4	102.1	211	163.1	133.8	261	201.7	165.5
12	09.3	07.6	62	47.9	39.3	12	86.6	71.0	62	125.2	102.7	12	163.8	134.4	62	202.5	166.1
13	10.1	08.2	63	48.7	40.0	13	87.3	71.7	63	126.0	103.4	13	164.6	135.1	63	203.2	166.8
14	10.8	08.9	64	49.5	40.6	14	88.1	72.3	64	126.7	104.0	14	165.4	135.7	64	204.0	167.4
15	11.6	09.5	65	50.2	41.2	15	88.9	72.9	65	127.5	104.6	15	166.1	136.3	65	204.8	168.0
16	12.4	10.1	66	51.0	41.9	116	89.6	73.6	166	128.3	105.3	216	166.9	137.0	266	205.6	168.7
17	13.1	10.8	67	51.8	42.5	17	90.4	74.2	67	129.1	105.9	17	167.7	137.6	67	206.3	169.3
18	13.9	11.4	68	52.6	43.1	18	91.2	74.8	68	129.8	106.5	18	168.5	138.2	68	207.1	170.0
19	14.7	12.0	69	53.3	43.8	19	92.0	75.5	69	130.6	107.2	19	169.2	138.9	69	207.9	170.6
20	15.5	12.7	70	54.1	44.4	20	92.7	76.1	70	131.4	107.8	20	170.0	139.5	70	208.6	171.2
21	16.2	13.3	71	54.9	45.0	121	93.5	76.7	171	132.1	108.4	221	170.8	140.1	271	209.4	171.9
22	17.0	14.0	72	55.6	45.7	22	94.3	77.4	72	132.9	109.1	22	171.6	140.8	72	210.2	172.5
23	17.8	14.6	73	56.4	46.3	23	95.1	78.0	73	133.7	109.7	23	172.3	141.4	73	211.0	173.1
24	18.5	15.2	74	57.2	46.9	24	95.8	78.6	74	134.5	110.3	24	173.1	142.0	74	211.7	173.8
25	19.3	15.9	75	58.0	47.6	25	96.6	79.3	75	135.2	111.0	25	173.9	142.7	75	212.5	174.4
26	20.1	16.5	76	58.7	48.2	126	97.4	79.9	176	136.0	111.6	226	174.6	143.3	276	213.3	175.0
27	20.9	17.1	77	59.5	48.8	27	98.1	80.5	77	136.8	112.2	27	175.4	144.0	77	214.1	175.7
28	21.6	17.8	78	60.3	49.5	28	98.9	81.2	78	137.6	112.9	28	176.2	144.6	78	214.8	176.3
29	22.4	18.4	79	61.1	50.1	29	99.7	81.8	79	138.3	113.5	29	177.0	145.2	79	215.6	176.9
30	23.2	19.0	80	61.8	50.7	30	100.5	82.4	80	139.1	114.1	30	177.7	145.9	80	216.4	177.6
31	24.0	19.7	81	62.6	51.4	131	101.2	83.1	181	139.9	114.8	231	178.5	146.5	281	217.1	178.2
32	24.7	20.3	82	63.4	52.0	32	102.0	83.7	82	140.6	115.4	32	179.3	147.1	82	217.9	178.8
33	25.5	20.9	83	64.1	52.6	33	102.8	84.3	83	141.4	116.0	33	180.1	147.8	83	218.7	179.5
34	26.3	21.6	84	64.9	53.3	34	103.6	85.0	84	142.2	116.7	34	180.8	148.4	84	219.5	180.1
35	27.1	22.2	85	65.7	53.9	35	104.3	85.6	85	143.0	117.3	35	181.6	149.0	85	220.2	180.7
36	27.8	22.8	86	66.5	54.5	136	105.1	86.2	186	143.7	118.0	236	182.4	149.7	286	221.0	181.4
37	28.6	23.5	87	67.2	55.2	37	105.9	86.9	87	144.5	118.6	37	183.1	150.3	87	221.8	182.0
38	29.4	24.1	88	68.0	55.8	38	106.6	87.5	88	145.3	119.2	38	183.9	150.9	88	222.6	182.6
39	30.1	24.7	89	68.8	56.4	39	107.4	88.1	89	146.1	119.9	39	184.7	151.6	89	223.3	183.3
40	30.9	25.4	90	69.6	57.1	40	108.2	88.8	90	146.8	120.5	40	185.5	152.2	90	224.1	183.9
41	31.7	26.0	91	70.3	57.7	141	109.0	89.4	191	147.6	121.1	241	186.2	152.8	291	224.9	184.5
42	32.5	26.6	92	71.1	58.3	42	109.7	90.0	92	148.4	121.8	42	187.0	153.5	92	225.6	185.2
43	33.2	27.3	93	71.9	59.0	43	110.5	90.7	93	149.1	122.4	43	187.8	154.1	93	226.4	185.8
44	34.0	27.9	94	72.6	59.6	44	111.3	91.3	94	149.9	123.0	44	188.6	154.7	94	227.2	186.4
45	34.8	28.5	95	73.4	60.2	45	112.1	92.0	95	150.7	123.7	45	189.3	155.4	95	228.0	187.1
46	35.6	29.2	96	74.2	60.9	146	112.8	92.6	196	151.5	124.3	246	190.1	156.0	296	228.7	187.7
47	36.3	29.8	97	75.0	61.5	47	113.6	93.2	97	152.2	124.9	47	190.9	156.6	97	229.5	188.3
48	37.1	30.4	98	75.7	62.1	48	114.4	93.9	98	153.0	125.6	48	191.6	157.3	98	230.3	189.0
49	37.9	31.1	99	76.5	62.8	49	115.1	94.5	99	153.8	126.2	49	192.4	157.9	99	231.1	189.6
50	38.6	31.7	100	77.3	63.4	150	115.9	95.1	200	154.6	126.8	250	193.2	158.5	300	231.8	190.2
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

*for 4  $\frac{1}{2}$  Points.*



72 *Difference of Latitude and Departure for 3  $\frac{1}{4}$  Points.*

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.7	00.7	51	37.8	34.2	101	74.8	67.8	151	111.9	101.4	201	148.9	135.0	251	185.9	168.5
2	01.5	01.3	52	38.5	34.9	02	75.6	68.5	52	112.6	102.1	02	149.6	135.6	52	186.7	169.2
3	02.2	02.0	53	39.3	35.6	03	76.3	69.2	53	113.3	102.7	03	150.4	136.3	53	187.4	169.9
4	03.0	02.7	54	40.0	36.3	04	77.0	69.8	54	114.1	103.4	04	151.1	137.0	54	188.2	170.6
5	03.7	03.4	55	40.7	36.9	05	77.8	70.5	55	114.8	104.1	05	151.9	137.6	55	188.9	171.2
6	04.4	04.0	56	41.5	37.6	106	78.5	71.2	156	115.6	104.7	206	152.6	138.3	256	189.6	171.9
7	05.2	04.7	57	42.2	38.3	07	79.3	71.8	57	116.3	105.4	07	153.3	139.0	57	190.4	172.6
8	05.9	05.4	58	43.0	38.9	08	80.0	72.5	58	117.0	106.1	08	154.1	139.7	58	191.1	173.2
9	06.7	06.0	59	43.7	39.6	09	80.7	73.2	59	117.8	106.8	09	154.8	140.3	59	191.9	173.9
10	07.4	06.7	60	44.4	40.3	10	81.5	73.9	60	118.5	107.4	10	155.6	141.0	60	192.6	174.6
11	08.2	07.4	61	45.2	41.0	111	82.2	74.5	161	119.3	108.1	211	156.3	141.7	261	193.3	175.2
12	08.9	08.1	62	45.9	41.6	12	83.0	75.2	62	120.0	108.8	12	157.0	142.3	62	194.1	175.9
13	09.6	08.7	63	46.7	42.3	13	83.7	75.9	63	120.7	109.4	13	157.8	143.0	63	194.8	176.6
14	10.4	09.4	64	47.4	43.0	14	84.4	76.5	64	121.5	110.1	14	158.5	143.7	64	195.6	177.3
15	11.1	10.1	65	48.2	43.6	15	85.2	77.2	65	122.2	110.8	15	159.3	144.4	65	196.3	177.9
16	11.9	10.7	66	48.9	44.3	116	85.9	77.9	166	123.0	111.5	216	160.0	145.0	266	197.0	178.6
17	12.6	11.4	67	49.6	45.0	17	86.7	78.6	67	123.7	112.1	17	160.7	145.7	67	197.8	179.3
18	13.3	12.1	68	50.4	45.7	18	87.4	79.2	68	124.4	112.8	18	161.5	146.4	68	198.5	179.9
19	14.1	12.8	69	51.1	46.3	19	88.2	79.9	69	125.2	113.5	19	162.2	147.0	69	199.3	180.6
20	14.8	13.4	70	51.9	47.0	20	88.9	80.6	70	125.9	114.1	20	163.0	147.7	70	200.0	181.3
21	15.6	14.1	71	52.6	47.7	121	89.6	81.2	171	126.7	114.8	221	163.7	148.4	271	200.7	182.0
22	16.3	14.8	72	53.3	48.3	22	90.4	81.9	72	127.4	115.5	22	164.4	149.1	72	201.5	182.6
23	17.0	15.4	73	54.1	49.0	23	91.1	82.6	73	128.2	116.2	23	165.2	149.7	73	202.2	183.3
24	17.8	16.1	74	54.8	49.7	24	91.9	83.3	74	128.9	116.8	24	165.9	150.4	74	203.0	184.0
25	18.5	16.8	75	55.6	50.4	25	92.6	83.9	75	129.6	117.5	25	166.7	151.1	75	203.7	184.6
26	19.3	17.5	76	56.3	51.0	126	93.3	84.6	176	130.4	118.2	226	167.4	151.7	276	204.4	185.3
27	20.0	18.1	77	57.0	51.7	27	94.1	85.3	77	131.1	118.8	27	168.2	152.4	77	205.2	186.0
28	20.7	18.8	78	57.8	52.4	28	94.8	85.9	78	131.9	119.5	28	168.9	153.1	78	205.9	186.7
29	21.5	19.5	79	58.5	53.0	29	95.6	86.6	79	132.6	120.2	29	169.6	153.8	79	206.7	187.3
30	22.2	20.1	80	59.3	53.7	30	96.3	87.3	80	133.3	120.9	30	170.4	154.4	80	207.4	188.0
31	23.0	20.8	81	60.0	54.4	131	97.0	88.0	181	134.1	121.5	231	171.1	155.1	281	208.2	188.7
32	23.7	21.5	82	60.7	55.1	32	97.8	88.6	82	134.8	122.2	32	171.9	155.8	82	208.9	189.3
33	24.4	22.2	83	61.5	55.7	33	98.5	89.3	83	135.6	122.9	33	172.6	156.4	83	209.6	190.0
34	25.2	22.8	84	62.2	56.4	34	99.3	90.0	84	136.3	123.5	34	173.3	157.1	84	210.4	190.7
35	25.9	23.5	85	63.0	57.1	35	100.0	90.6	85	137.0	124.2	35	174.1	157.8	85	211.1	191.4
36	26.7	24.2	86	63.7	57.7	136	100.7	91.3	186	137.8	124.9	236	174.8	158.5	286	211.9	192.0
37	27.4	24.8	87	64.4	58.4	37	101.5	92.0	87	138.5	125.6	37	175.6	159.1	87	212.6	192.7
38	28.2	25.5	88	65.2	59.1	38	102.2	92.7	88	139.3	126.2	38	176.3	159.8	88	213.3	193.4
39	28.9	26.2	89	65.9	59.8	39	103.0	93.3	89	140.0	126.9	39	177.0	160.5	89	214.1	194.0
40	29.6	26.9	90	66.7	60.4	40	103.7	94.0	90	140.7	127.6	40	177.8	161.1	90	214.8	194.7
41	30.4	27.5	91	67.4	61.1	141	104.4	94.7	191	141.5	128.2	241	178.5	161.8	291	215.6	195.4
42	31.1	28.2	92	68.2	61.8	42	105.2	95.3	92	142.2	128.9	42	179.3	162.5	92	216.3	196.1
43	31.9	28.9	93	68.9	62.4	43	105.9	96.0	93	143.0	129.6	43	180.0	163.2	93	217.0	196.7
44	32.6	29.5	94	69.6	63.1	44	106.7	96.7	94	143.7	130.3	44	180.7	163.8	94	217.8	197.4
45	33.3	30.2	95	70.4	63.8	45	107.4	97.4	95	144.4	130.9	45	181.5	164.5	95	218.5	198.1
46	34.1	30.9	96	71.1	64.5	146	108.2	98.0	196	145.2	131.6	246	182.2	165.2	296	219.3	198.7
47	34.8	31.6	97	71.9	65.1	47	108.9	98.7	97	145.9	132.3	47	183.0	165.8	97	220.0	199.4
48	35.6	32.2	98	72.6	65.8	48	109.6	99.4	98	146.7	132.9	48	183.7	166.5	98	220.7	200.1
49	36.3	32.9	99	73.3	66.5	49	110.4	100.0	99	147.4	133.6	49	184.4	167.2	99	221.5	200.8
50	37.0	33.6	100	74.1	67.1	150	111.1	100.7	200	148.2	134.3	250	185.2	167.9	300	222.2	201.4
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

*for 4  $\frac{1}{4}$  Points.*

# Difference of Latitude and Departure for 4 Points.

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Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.7	00.7	51	36.1	36.1	101	71.4	71.4	151	106.8	106.8	201	142.1	142.1	251	177.5	177.5
2	01.4	01.4	52	36.8	36.8	02	72.1	72.1	52	107.5	107.5	02	142.8	142.8	52	178.2	178.2
3	02.1	02.1	53	37.5	37.5	03	72.8	72.8	53	108.2	108.2	03	143.5	143.5	53	178.9	178.9
4	02.8	02.8	54	38.2	38.2	04	73.5	73.5	54	108.9	108.9	04	144.2	144.2	54	179.6	179.6
5	03.5	03.5	55	38.9	38.9	05	74.2	74.2	55	109.6	109.6	05	144.9	144.9	55	180.3	180.3
6	04.2	04.2	56	39.6	39.6	106	74.9	74.9	156	110.3	110.3	206	145.7	145.7	256	181.0	181.0
7	04.9	04.9	57	40.3	40.3	07	75.7	75.7	57	111.0	111.0	07	146.4	146.4	57	181.7	181.7
8	05.7	05.7	58	41.0	41.0	08	76.4	76.4	58	111.7	111.7	08	147.1	147.1	58	182.4	182.4
9	06.4	06.4	59	41.7	41.7	09	77.1	77.1	59	112.4	112.4	09	147.8	147.8	59	183.1	183.1
10	07.1	07.1	60	42.4	42.4	10	77.8	77.8	60	113.1	113.1	10	148.5	148.5	60	183.8	183.8
11	07.8	07.8	61	43.1	43.1	111	78.5	78.5	161	113.8	113.8	211	149.2	149.2	261	184.5	184.5
12	08.5	08.5	62	43.8	43.8	12	79.2	79.2	62	114.5	114.5	12	149.9	149.9	62	185.3	185.3
13	09.2	09.2	63	44.5	44.5	13	79.9	79.9	63	115.3	115.3	13	150.6	150.6	63	186.0	186.0
14	09.9	09.9	64	45.3	45.3	14	80.6	80.6	64	116.0	116.0	14	151.3	151.3	64	186.7	186.7
15	10.6	10.6	65	46.0	46.0	15	81.3	81.3	65	116.7	116.7	15	152.0	152.0	65	187.4	187.4
16	11.3	11.3	66	46.7	46.7	116	82.0	82.0	166	117.4	117.4	216	152.7	152.7	266	188.1	188.1
17	12.0	12.0	67	47.4	47.4	17	82.7	82.7	67	118.1	118.1	17	153.4	153.4	67	188.8	188.8
18	12.7	12.7	68	48.1	48.1	18	83.4	83.4	68	118.8	118.8	18	154.1	154.1	68	189.5	189.5
19	13.4	13.4	69	48.8	48.8	19	84.1	84.1	69	119.5	119.5	19	154.8	154.8	69	190.2	190.2
20	14.1	14.1	70	49.5	49.5	20	84.8	84.8	70	120.2	120.2	20	155.6	155.6	70	190.9	190.9
21	14.8	14.8	71	50.2	50.2	121	85.6	85.6	171	120.9	120.9	221	156.3	156.3	271	191.6	191.6
22	15.6	15.6	72	50.9	50.9	22	86.3	86.3	72	121.6	121.6	22	157.0	157.0	72	192.3	192.3
23	16.3	16.3	73	51.6	51.6	23	87.0	87.0	73	122.3	122.3	23	157.7	157.7	73	193.0	193.0
24	17.0	17.0	74	52.3	52.3	24	87.7	87.7	74	123.0	123.0	24	158.4	158.4	74	193.7	193.7
25	17.7	17.7	75	53.0	53.0	25	88.4	88.4	75	123.7	123.7	25	159.1	159.1	75	194.4	194.4
26	18.4	18.4	76	53.7	53.7	126	89.1	89.1	176	124.4	124.4	226	159.8	159.8	276	195.2	195.2
27	19.1	19.1	77	54.4	54.4	27	89.8	89.8	77	125.2	125.2	27	160.5	160.5	77	195.9	195.9
28	19.8	19.8	78	55.2	55.2	28	90.5	90.5	78	125.9	125.9	28	161.2	161.2	78	196.6	196.6
29	20.5	20.5	79	55.9	55.9	29	91.2	91.2	79	126.6	126.6	29	161.9	161.9	79	197.3	197.3
30	21.2	21.2	80	56.6	56.6	30	91.9	91.9	80	127.3	127.3	30	162.6	162.6	80	198.0	198.0
31	21.9	21.9	81	57.3	57.3	131	92.6	92.6	181	128.0	128.0	231	163.3	163.3	281	198.7	198.7
32	22.6	22.6	82	58.0	58.0	32	93.3	93.3	82	128.7	128.7	32	164.0	164.0	82	199.4	199.4
33	23.3	23.3	83	58.7	58.7	33	94.0	94.0	83	129.4	129.4	33	164.7	164.7	83	200.1	200.1
34	24.0	24.0	84	59.4	59.4	34	94.7	94.7	84	130.1	130.1	34	165.5	165.5	84	200.8	200.8
35	24.7	24.7	85	60.1	60.1	35	95.5	95.5	85	130.8	130.8	35	166.2	166.2	85	201.5	201.5
36	25.5	25.5	86	60.8	60.8	136	96.2	96.2	186	131.5	131.5	236	166.9	166.9	286	202.2	202.2
37	26.2	26.2	87	61.5	61.5	37	96.9	96.9	87	132.2	132.2	37	167.6	167.6	87	202.9	202.9
38	26.9	26.9	88	62.2	62.2	38	97.6	97.6	88	132.9	132.9	38	168.3	168.3	88	203.6	203.6
39	27.6	27.6	89	62.9	62.9	39	98.3	98.3	89	133.6	133.6	39	169.0	169.0	89	204.3	204.3
40	28.3	28.3	90	63.6	63.6	40	99.0	99.0	90	134.3	134.3	40	169.7	169.7	90	205.1	205.1
41	29.0	29.0	91	64.3	64.3	141	99.7	99.7	191	135.1	135.1	241	170.4	170.4	291	205.8	205.8
42	29.7	29.7	92	65.1	65.1	42	100.4	100.4	92	135.8	135.8	42	171.1	171.1	92	206.5	206.5
43	30.4	30.4	93	65.8	65.8	43	101.1	101.1	93	136.5	136.5	43	171.8	171.8	93	207.2	207.2
44	31.1	31.1	94	66.5	66.5	44	101.8	101.8	94	137.2	137.2	44	172.5	172.5	94	207.9	207.9
45	31.8	31.8	95	67.2	67.2	45	102.5	102.5	95	137.9	137.9	45	173.2	173.2	95	208.6	208.6
46	32.5	32.5	96	67.9	67.9	146	103.2	103.2	196	138.6	138.6	246	173.9	173.9	296	209.3	209.3
47	33.2	33.2	97	68.6	68.6	47	103.9	103.9	97	139.3	139.3	47	174.6	174.6	97	210.0	210.0
48	33.9	33.9	98	69.3	69.3	48	104.6	104.6	98	140.0	140.0	48	175.4	175.4	98	210.7	210.7
49	34.6	34.6	99	70.0	70.0	49	105.4	105.4	99	140.7	140.7	49	176.1	176.1	99	211.4	211.4
50	35.4	35.4	100	70.7	70.7	150	106.1	106.1	200	141.4	141.4	250	176.8	176.8	300	212.1	212.1
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 4 Points.

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# A TABLE of Numbers for the reader finding the Time of High-Water on any Day.

Month Days	Year 1759.												Month Days	Year 1760.											
	January	February	March	April	May	June	July	August	September	October	November	December		January	February	March	April	May	June	July	August	September	October	November	December
1	12	14	12	14	15	16	17	18	20	20	21	21	1	23	24	24	25	26	28	28	30	31	32	33	33
2	13	15	13	15	16	17	18	19	21	21	22	22	2	24	25	25	26	27	29	29	31	32	33	34	34
3	14	16	14	16	17	18	19	20	22	22	23	23	3	25	26	26	27	28	30	30	32	33	34	35	35
4	15	17	15	17	18	19	20	21	23	23	24	24	4	26	27	27	28	29	31	31	33	34	35	36	36
5	16	18	16	18	19	20	21	22	24	24	25	25	5	27	28	28	29	30	32	32	34	35	36	37	37
6	17	19	17	19	20	21	22	23	25	25	26	26	6	28	29	29	30	31	33	33	35	36	37	38	38
7	18	20	18	20	21	22	23	24	26	26	27	27	7	29	30	30	31	32	34	34	36	37	38	39	39
8	19	21	19	21	22	23	24	25	27	27	28	28	8	30	31	31	32	33	35	35	37	38	39	40	40
9	20	22	20	22	23	24	25	26	28	28	29	29	9	31	32	32	33	34	36	36	38	39	40	11	11
10	21	23	21	23	24	25	26	27	29	29	30	30	10	32	33	33	34	35	37	37	39	40	11	12	12
11	22	24	22	24	25	26	27	28	30	30	31	31	11	33	34	34	35	36	38	38	40	11	12	13	13
12	23	25	23	25	26	27	28	29	31	31	32	32	12	34	35	35	36	37	39	39	11	12	13	14	14
13	24	26	24	26	27	28	29	30	32	32	33	33	13	35	36	36	37	38	40	40	12	13	14	15	15
14	25	27	25	27	28	29	30	31	33	33	34	34	14	36	37	37	38	39	11	11	13	14	15	16	16
15	26	28	26	28	29	30	31	32	34	34	35	35	15	37	38	38	39	40	12	12	14	15	16	17	17
16	27	29	27	29	30	31	32	33	35	35	36	36	16	38	39	39	40	11	13	13	15	16	17	18	18
17	28	30	28	30	31	32	33	34	36	36	37	37	17	39	40	40	11	12	14	14	16	17	18	19	19
18	29	31	29	31	32	33	34	35	37	37	38	38	18	40	11	11	12	13	15	15	17	18	19	20	20
19	30	32	30	32	33	34	35	36	38	38	39	39	19	11	12	12	13	14	16	16	18	19	20	21	21
20	31	33	31	33	34	35	36	37	39	39	40	40	20	12	13	13	14	15	17	17	19	20	21	22	22
21	32	34	32	34	35	36	37	38	40	40	11	11	21	13	14	14	15	16	18	18	20	21	22	23	23
22	33	35	33	35	36	37	38	39	11	11	12	12	22	14	15	15	16	17	19	19	21	22	23	24	24
23	34	36	34	36	37	38	39	40	12	12	13	13	23	15	16	16	17	18	20	20	22	23	24	25	25
24	35	37	35	37	38	39	40	11	13	13	14	14	24	16	17	17	18	19	21	21	23	24	25	26	26
25	36	38	36	38	39	40	11	12	14	14	15	15	25	17	18	18	19	20	22	22	24	25	26	27	27
26	37	39	37	39	40	11	12	13	15	15	16	16	26	18	19	19	20	21	23	23	25	26	27	28	28
27	38	40	38	40	11	12	13	14	16	16	17	17	27	19	20	20	21	22	24	24	26	27	28	29	29
28	39	11	39	11	12	13	14	15	17	17	18	18	28	20	21	21	22	23	25	25	27	28	29	30	30
29	40		40	12	13	14	15	16	18	18	19	19	29	21	22	22	23	24	26	26	28	29	30	31	31
30	11		11	13	14	15	16	17	19	19	20	20	30	22		23	24	25	27	27	29	30	31	32	32
31	12		12	15	17	18	18	20	20	21	21	21	31	23		24	26	28	30	30	32	32	33	33	33

# A TABLE of Numbers for the reader finding the Time of High-Water on any Day.

Year 1761.													Year 1762.												
Month Days													Month Days												
	January	February	March	April	May	June	July	August	September	October	November	December		January	February	March	April	May	June	July	August	September	October	November	December
1	34	36	34	36	37	38	39	40	12	13	14	14	1	15	17	16	17	18	19	20	21	22	23	25	25
2	35	37	35	37	38	39	40	11	13	14	15	15	2	16	18	17	18	19	20	21	22	23	24	26	26
3	36	38	36	38	39	40	11	12	14	15	16	16	3	17	19	18	19	20	21	22	23	24	25	27	27
4	37	39	37	39	40	11	12	13	15	16	17	17	4	18	20	19	20	21	22	23	24	25	26	28	28
5	38	40	38	40	11	12	13	14	16	17	18	18	5	19	21	20	21	22	23	24	25	26	27	29	29
6	39	11	39	11	12	13	14	15	17	18	19	19	6	20	22	21	22	23	24	25	26	27	28	30	30
7	40	12	40	12	13	14	15	16	18	19	20	20	7	21	23	22	23	24	25	26	27	28	29	31	31
8	11	13	11	13	14	15	16	17	19	20	21	21	8	22	24	23	24	25	26	27	28	29	30	32	32
9	12	14	12	14	15	16	17	18	20	21	22	22	9	23	25	24	25	26	27	28	29	30	31	33	33
10	13	15	13	15	16	17	18	19	21	22	23	23	10	24	26	25	26	27	28	29	30	31	32	34	34
11	14	16	14	16	17	18	19	20	22	23	24	24	11	25	27	26	27	28	29	30	31	32	33	35	35
12	15	17	15	17	18	19	20	21	23	24	25	25	12	26	28	27	28	29	30	31	32	33	34	36	36
13	16	18	16	18	19	20	21	22	24	25	26	26	13	27	29	28	29	30	31	32	33	34	35	37	37
14	17	19	17	19	20	21	22	23	25	26	27	27	14	28	30	29	30	31	32	33	34	35	36	38	38
15	18	20	18	20	21	22	23	24	26	27	28	28	15	29	31	30	31	32	33	34	35	36	37	39	39
16	19	21	19	21	22	23	24	25	27	28	29	29	16	30	32	31	32	33	34	35	36	37	38	40	40
17	20	22	20	22	23	24	25	26	28	29	30	30	17	31	33	32	33	34	35	36	37	38	39	11	11
18	21	23	21	23	24	25	26	27	29	30	31	31	18	32	34	33	34	35	36	37	38	39	40	12	12
19	22	24	22	24	25	26	27	28	30	31	32	32	19	33	35	34	35	36	37	38	39	40	11	13	13
20	23	25	23	25	26	27	28	29	31	32	33	33	20	34	36	35	36	37	38	39	40	11	12	14	14
21	24	26	24	26	27	28	29	30	32	33	34	34	21	35	37	36	37	38	39	40	11	12	13	15	15
22	25	27	25	27	28	29	30	31	33	34	35	35	22	36	38	37	38	39	40	11	12	13	14	16	16
23	26	28	26	28	29	30	31	32	34	35	36	36	23	37	39	38	39	40	11	12	13	14	15	17	17
24	27	29	27	29	30	31	32	33	35	36	37	37	24	38	40	39	40	11	12	13	14	15	16	18	18
25	28	30	28	30	31	32	33	34	36	37	38	38	25	39	11	40	11	12	13	14	15	16	17	19	19
26	29	31	29	31	32	33	34	35	37	38	39	39	26	40	12	11	12	13	14	15	16	17	18	20	20
27	30	32	30	32	33	34	35	36	38	39	40	40	27	11	13	12	13	14	15	16	17	18	19	21	21
28	31	33	31	33	34	35	36	37	39	40	11	11	28	12	14	13	14	15	16	17	18	19	20	22	22
29	32		32	34	35	36	37	38	40	11	12	12	29	13		14	15	16	17	18	19	20	21	23	23
30	33		33	35	36	37	38	39	11	12	13	13	30	14		15	16	17	18	19	20	21	22	24	24
31	34		34		37		39	40		13		14	31	15		16		18		20	21		23		25



A TABLE of Numbers for the reader finding  
the Time of High-Water on any Day.

Year 1763.													Year 1764.												
Month Days	January	February	March	April	May	June	July	August	September	October	November	December	Month Days	January	February	March	April	May	June	July	August	September	October	November	December
1	26	28	27	28	29	30	31	32	34	34	36	36	1	37	39	38	39	40	11	12	13	15	16	17	17
2	27	29	28	29	30	31	32	33	35	35	37	37	2	38	40	39	40	11	12	13	14	16	17	18	18
3	28	30	29	30	31	32	33	34	36	36	38	38	3	39	11	40	11	12	13	14	15	17	18	19	19
4	29	31	30	31	32	33	34	35	37	37	39	39	4	40	12	11	12	13	14	15	16	18	19	20	20
5	30	32	31	32	33	34	35	36	38	38	40	40	5	11	13	12	13	14	15	16	17	19	20	21	21
6	31	33	32	33	34	35	36	37	39	39	11	11	6	12	14	13	14	15	16	17	18	20	21	22	22
7	32	34	33	34	35	36	37	38	40	40	12	12	7	13	15	14	15	16	17	18	19	21	22	23	23
8	33	35	34	35	36	37	38	39	11	11	13	13	8	14	16	15	16	17	18	19	20	22	23	24	24
9	34	36	35	36	37	38	39	40	12	12	14	14	9	15	17	16	17	18	19	20	21	23	24	25	25
10	35	37	36	37	38	39	40	11	13	13	15	15	10	16	18	17	18	19	20	21	22	24	25	26	26
11	36	38	37	38	39	40	11	12	14	14	16	16	11	17	19	18	19	20	21	22	23	25	26	27	27
12	37	39	38	39	40	11	12	13	15	15	17	17	12	18	20	19	20	21	22	23	24	26	27	28	28
13	38	40	39	40	11	12	13	14	16	16	18	18	13	19	21	20	21	22	23	24	25	27	28	29	29
14	39	11	40	11	12	13	14	15	17	17	19	19	14	20	22	21	22	23	24	25	26	28	29	30	30
15	40	12	11	12	13	14	15	16	18	18	20	20	15	21	23	22	23	24	25	26	27	29	30	31	31
16	11	13	12	13	14	15	16	17	19	19	21	21	16	22	24	23	24	25	26	27	28	30	31	32	32
17	12	14	13	14	15	16	17	18	20	20	22	22	17	23	25	24	25	26	27	28	29	31	32	33	33
18	13	15	14	15	16	17	18	19	21	21	23	23	18	24	26	25	26	27	28	29	30	32	33	34	34
19	14	16	15	16	17	18	19	20	22	22	24	24	19	25	27	26	27	28	29	30	31	33	34	35	35
20	15	17	16	17	18	19	20	21	23	23	25	25	20	26	28	27	28	29	30	31	32	34	35	36	36
21	16	18	17	18	19	20	21	22	24	24	26	26	21	27	29	28	29	30	31	32	33	35	36	37	37
22	17	19	18	19	20	21	22	23	25	25	27	27	22	28	30	29	30	31	32	33	34	36	37	38	38
23	18	20	19	20	21	22	23	24	26	26	28	28	23	29	31	30	31	32	33	34	35	37	38	39	39
24	19	21	20	21	22	23	24	25	27	27	29	29	24	30	32	31	32	33	34	35	36	38	39	40	40
25	20	22	21	22	23	24	25	26	28	28	30	30	25	31	33	32	33	34	35	36	37	39	40	11	11
26	21	23	22	23	24	25	26	27	29	29	31	31	26	32	34	33	34	35	36	37	38	40	11	12	12
27	22	24	23	24	25	26	27	28	30	30	32	32	27	33	35	34	35	36	37	38	39	11	12	13	13
28	23	25	24	25	26	27	28	29	31	31	33	33	28	34	36	35	36	37	38	39	40	12	13	14	14
29	24	26	25	26	27	28	29	30	32	32	34	34	29	35	37	36	37	38	39	40	11	13	14	15	15
30	25	27	26	27	28	29	30	31	33	33	35	35	30	36	38	37	38	39	40	11	12	14	15	16	16
31	26	28	27	28	29	30	31	32	34	34	36	36	31	37	39	38	40	12	13	14	15	16	17	17	

# A TABLE of Numbers for the reader finding the Time of High-Water on any Day.

Year 1765.													Year 1766.												
Month Days	January	February	March	April	May	June	July	August	September	October	November	December	Month Days	January	February	March	April	May	June	July	August	September	October	November	December
1	18	20	19	20	21	22	23	24	26	26	28	28	1	29	31	30	31	32	33	34	35	37	37	39	39
2	19	21	20	21	22	23	24	25	27	27	29	29	2	30	32	31	32	33	34	35	36	38	38	40	40
3	20	22	21	22	23	24	25	26	28	28	30	30	3	31	33	32	33	34	35	36	37	39	39	11	11
4	21	23	22	23	24	25	26	27	29	29	31	31	4	32	34	33	34	35	36	37	38	40	40	12	12
5	22	24	23	24	25	26	27	28	30	30	32	32	5	33	35	34	35	36	37	38	39	11	11	13	13
6	23	25	24	25	26	27	28	29	31	31	33	33	6	34	36	35	36	37	38	39	40	12	12	14	14
7	24	26	25	26	27	28	29	30	32	32	34	34	7	35	37	36	37	38	39	40	11	13	13	15	15
8	25	27	26	27	28	29	30	31	33	33	35	35	8	36	38	37	38	39	40	11	12	14	14	16	16
9	26	28	27	28	29	30	31	32	34	34	36	36	9	37	39	38	39	40	11	12	13	15	15	17	17
10	27	29	28	29	30	31	32	33	35	35	37	37	10	38	40	39	40	11	12	13	14	16	16	18	18
11	28	30	29	30	31	32	33	34	36	36	38	38	11	39	11	40	11	12	13	14	15	17	17	19	19
12	29	31	30	31	32	33	34	35	37	37	39	39	12	40	12	11	12	13	14	15	16	18	18	20	20
13	30	32	31	32	33	34	35	36	38	38	40	40	13	11	13	12	13	14	15	16	17	19	19	21	21
14	31	33	32	33	34	35	36	37	39	39	11	11	14	12	14	13	14	15	16	17	18	20	20	22	22
15	32	34	33	34	35	36	37	38	40	40	12	12	15	13	15	14	15	16	17	18	19	21	21	23	23
16	33	35	34	35	36	37	38	39	11	11	13	13	16	14	16	15	16	17	18	19	20	22	22	24	24
17	34	36	35	36	37	38	39	40	12	12	14	14	17	15	17	16	17	18	19	20	21	23	23	25	25
18	35	37	36	37	38	39	40	11	13	13	15	15	18	16	18	17	18	19	20	21	22	24	24	26	26
19	36	38	37	38	39	40	11	12	14	14	16	16	19	17	19	18	19	20	21	22	23	25	25	27	27
20	37	39	38	39	40	11	12	13	15	15	17	17	20	18	20	19	20	21	22	23	24	26	26	28	28
21	38	40	39	40	11	12	13	14	16	16	18	18	21	19	21	20	21	22	23	24	25	27	27	29	29
22	39	11	40	11	12	13	14	15	17	17	19	19	22	20	22	21	22	23	24	25	26	28	28	30	30
23	40	12	11	12	13	14	15	16	18	18	20	20	23	21	23	22	23	24	25	26	27	29	29	31	31
24	11	13	12	13	14	15	16	17	19	19	21	21	24	22	24	23	24	25	26	27	28	30	30	32	32
25	12	14	13	14	15	16	17	18	20	20	22	22	25	23	25	24	25	26	27	28	29	31	31	33	33
26	13	15	14	15	16	17	18	19	21	21	23	23	26	24	26	25	26	27	28	29	30	32	32	34	34
27	14	16	15	16	17	18	19	20	22	22	24	24	27	25	27	26	27	28	29	30	31	33	33	35	35
28	15	17	16	17	18	19	20	21	23	23	25	25	28	26	28	27	28	29	30	31	32	34	34	36	36
29	16	18	17	18	19	20	21	22	24	24	26	26	29	27	29	28	29	30	31	32	33	35	35	37	37
30	17	19	18	19	20	21	22	23	25	25	27	27	30	28	30	29	30	31	32	33	34	36	36	38	38
31	18	19	21	21	23	24	26	28	26	26	28	28	31	29	31	30	32	34	35	36	37	37	39	39	40



# A TABLE of Num- bers, &c.

Year 1767.

Mouth Days	January	February	March	April	May	June	July	August	September	October	November	December
1	11	13	12	13	14	15	16	17	19	19	21	21
2	12	14	13	14	15	16	17	18	20	20	22	22
3	13	15	14	15	16	17	18	19	21	21	23	23
4	14	16	15	16	17	18	19	20	22	22	24	24
5	15	17	16	17	18	19	20	21	23	23	25	25
6	16	18	17	18	19	20	21	22	24	24	26	26
7	17	19	18	19	20	21	22	23	25	25	27	27
8	18	20	19	20	21	22	23	24	26	26	28	28
9	19	21	20	21	22	23	24	25	27	27	29	29
10	20	22	21	22	23	24	25	26	28	28	30	30
11	21	23	22	23	24	25	26	27	29	29	31	31
12	22	24	23	24	25	26	27	28	30	30	32	32
13	23	25	24	25	26	27	28	29	31	31	33	33
14	24	26	25	26	27	28	29	30	32	32	34	34
15	25	27	26	27	28	29	30	31	33	33	35	35
16	26	28	27	28	29	30	31	32	34	34	36	36
17	27	29	28	29	30	31	32	33	35	35	37	37
18	28	30	29	30	31	32	33	34	36	36	38	38
19	29	31	30	31	32	33	34	35	37	37	39	39
20	30	32	31	32	33	34	35	36	38	38	40	40
21	31	33	32	33	34	35	36	37	39	39	11	11
22	32	34	33	34	35	36	37	38	40	40	12	12
23	33	35	34	35	36	37	38	39	11	11	13	13
24	34	36	35	36	37	38	39	40	12	12	14	14
25	35	37	36	37	38	39	40	11	13	13	15	15
26	36	38	37	38	39	40	11	12	14	14	16	16
27	37	39	38	39	40	11	12	13	15	15	17	17
28	38	40	39	40	11	12	13	14	16	16	18	18
29	39	40	11	12	13	14	15	16	17	17	19	19
30	40	11	12	13	14	15	16	17	18	18	20	20
31	11	12	13	14	15	16	17	18	19	19	21	21

# A TABLE answering to any of the foregoing Numbers.

Num- bers.	Times answering H. M.
11	0 ——— 48
12	1 ——— 36
13	2 ——— 24
14	3 ——— 12
15	4 ——— 00
16	4 ——— 48
17	5 ——— 36
18	6 ——— 24
19	7 ——— 12
20	8 ——— 00
21	8 ——— 48
22	9 ——— 36
23	10 ——— 24
24	11 ——— 12
25	12 ——— 00
} Afternoon	
26	0 ——— 48
27	1 ——— 36
28	2 ——— 24
29	3 ——— 12
30	4 ——— 00
31	4 ——— 48
32	5 ——— 36
33	6 ——— 24
34	7 ——— 12
35	8 ——— 00
36	8 ——— 48
37	9 ——— 36
38	10 ——— 24
39	11 ——— 12
40	12 ——— 00
} After Midnight	

*The Use of the foregoing Tables of Numbers.*

**I**N these Tables, each Page is divided into two Parts, by a double Line drawn down the middle; and each of the Parts are marked at the Top with the Year for which they shew the Numbers, and under that, the Left-Hand Column of each Part is marked with the Days of the Month, and the other Columns with the Months of the Year: So that if you would know the Number for any Day, suppose for Example, on the 12<sup>th</sup> of *March*, 1759.

First, find the given Year 1759 at the Top of the Table, and then under the given Month, which is *March*, and right against the given Day of the Month (which in this Case is 12) you will find the Number 23, which is the Number for that Day; and if from the Number so found you subtract 10, the Remainder will be the Moon's Age for that Day.

*The Use of the Table of the Times answering to the foregoing Numbers.*

In this Table the Left-hand Column is mark'd with the given Numbers from 11 to 40, and the Figures right against any of these Numbers, gives the Time answering to it, in Hours and Minutes.

## EXAMPLE I.

*I would know what Time answers to the Number 23?*

*Answer.* 10 Hours 24 Minutes Afternoon, that is, at 24 Minutes past Ten at Night.

## EXAMPLE II.

*What Number and Time answers to the 25<sup>th</sup> of January, 1759.*

First, by the Tables of Numbers, I find the Number to be 36, and against that Number, in the Table of Times, I find 8 Hours 48 Minutes after Midnight that is, 48 Minutes past Eight in the Morning. A



A.		H	M			H	M
At <i>Army</i> —————		01	03	At <i>Cork, Calis, Cape Clear,</i>			
At <i>Amsterdam &amp; Armentie</i>		03	00	and in the <i>Creek</i> —————		04	30
At <i>Abarwark</i> —————		04	30	At <i>Caldy &amp; Comarthen Bay</i>		05	15
At <i>Abermorick &amp; Antwerk</i>		06	00	At <i>Concalo</i> —————		06	00
At <i>Aldborough</i> —————		09	45	Without the <i>Caskets</i> ———		08	15
B.				Between the <i>Caskets</i> and			
At <i>Beachy, Blacktail, and</i>				<i>Guernsey, before Cromer at</i>			
before the <i>Race of Blanquet</i>		12	00	<i>Seven Cliffs, and at Catnefs—</i>		09	00
Thwart of <i>Beachy</i> —————		12	45	At the <i>Caskets and Cham-</i>			
At <i>Blacknefs, in Bluet, and</i>				<i>bernefs</i> —————		09	45
at <i>Bell-Isle</i> —————		01	30	At <i>Cows, in the Fofs of</i>			
Without <i>Bluet</i> and at <i>Ber-</i>				<i>Caen, in Calice and Chamber-</i>			
<i>wick</i> —————		02	15	<i>nefs Roads</i> —————		10	30
<i>Bourdeaux River, the South</i>				Before the <i>Haven of Caen,</i>			
<i>Coast of Bretagne, the Coast</i>				in the <i>Chamber, between</i>			
of <i>Biscay, and at Bocknefs</i> —		03	00	<i>Cripple-Sand and the Croyle,</i>			
At <i>Brest, before the Base,</i>				and at <i>Calshot</i> —————		11	15
and the <i>River of Bourdeaux</i>				D.			
within the <i>Haven</i> —————		03	45	At <i>Dover Pier, and before</i>			
In <i>Breesound, Bloy and Bal-</i>				<i>Dunkirk</i> —————		12	30
<i>timore</i> —————		04	30	At <i>Denbeigh &amp; Downs Road</i>		02	15
Before <i>Bremen &amp; at Black-</i>				At <i>Dort</i> —————		03	00
<i>ney, and in the Channel be-</i>				At <i>Dungarven</i> —————		04	30
fore <i>Bourdeaux</i> —————		06	00	At <i>Dartmouth</i> —————		06	00
At <i>Bristol Key</i> —————		06	45	At <i>Dublin</i> —————		08	15
At <i>Bridgewater</i> —————		07	30	At <i>Dunbar</i> —————		09	00
<i>Bullen Deep</i> —————		10	30	At <i>Dungeness and Dunnose</i>		09	45
C.				At <i>Dover, Diepe and Deal</i>		10	30
In <i>Condado</i> —————		12	00	E.			
In the <i>Chamber of Rye</i>		00	45	At <i>Emden, before the Elve,</i>			
Without <i>Calis, at Corpus</i>				before the <i>Eyder, and before</i>			
<i>Christi Point, and at Camfer</i>		01	30	<i>Enchusen</i> —————		12	00
Between <i>Calis, and Dover,</i>				At <i>Edam</i> —————		01	30
before <i>Conquet, and at the</i>				Before the <i>Eastern &amp; West-</i>			
<i>North Cape</i> —————		03	00	<i>ern Emes, and at Engomonts</i>		09	00
							On

## A T I D E - T A B L E.

81

F.		H	M			H	M
On the Coast of <i>Flanders</i>		12	00	Under <i>Holy Island</i> , & at <i>Horn</i>		01	30
At <i>Flushing</i> —————		00	45	Before <i>Hartlepoole</i> —————		03	00
Before the <i>Fen</i> in the				At <i>Huntcliff-Foot</i> —————		03	45
Channel —————		01	30	At <i>Humber</i> —————		05	15
Without <i>Fountny</i> —————		02	15	Before <i>Hamborough</i> , at <i>Hull</i> ,			
Without the Banks of				at the <i>Holmes</i> , and before			
<i>Flanders</i> —————		03	00	<i>Humbers Mouth</i> —————		06	00
At <i>Flamborough</i> and <i>Brid-</i>				At <i>Harlem</i> , <i>Havre de Grace</i>			
<i>lington</i> —————		04	30	and <i>Home-bead</i> —————		09	00
At the <i>Forn</i> , in <i>Foy</i> at				At <i>St. Hellens</i> , at <i>Harwich</i>			
<i>Falmouth</i> —————		05	15	and without the Banks of			
Between <i>Foy</i> & <i>Falmouth</i> in				<i>Harwich</i> —————		10	30
the Channel, and at <i>Foulness</i>		06	45	At <i>Harwich</i> within ———		11	15
Before the Coast of <i>Friez-</i>							
<i>land</i> and the <i>Fly</i> —————		07	30	I.			
Without the <i>Fly</i> —————		08	15	At <i>Jutland Islands</i> —————		12	00
At <i>Frize</i> and <i>Fair Isle</i> —		09	00	On the W. Coast of <i>Ireland</i>		03	00
At the <i>Fritb</i> and South				In all the Havens on the			
<i>Foreland</i> —————		10	30	South Coast of <i>Ireland</i> ———		05	15
In <i>Fair Isle Road</i> , and at							
the North <i>Forland</i> —————		11	15	K.			
				<i>Kentish Knock</i> —————		12	00
G.				At <i>Kelliers</i> —————		03	00
In <i>Gibraltar Road</i> , at <i>Gra-</i>				At <i>Kingsale</i> —————		04	30
<i>veling</i> , and before <i>Cherburg</i>		12	00	At <i>Kylduyn</i> —————		07	30
Before <i>Goree</i> , at <i>Guernsey</i> ,				At <i>Kildive</i> —————		09	00
and at <i>Gravesend</i> —————		01	30				
At <i>Groine</i> , at <i>Gascoign</i> , &				L.			
the Coast of <i>Galicia</i> —————		03	00	At <i>Leith</i> —————		12	00
Thwart of <i>Guernsey</i> ———		09	45	At <i>Lisbon</i> —————		02	15
In the <i>Chamber</i> , & <i>Goree-</i>				At <i>London</i> —————		03	00
<i>end</i> —————		11	15	Thwart of <i>Londey</i> and be-			
				fore <i>Lynn</i> —————		05	15
H.				At <i>Lynn</i> half Tide, at			
Before the <i>Hever</i> , before				<i>Londey</i> —————		06	00
<i>Horn</i> , and at <i>Hampton-Key</i> —		12	00	At <i>Lynn</i> —————		06	45

M

At



	H	M	O	H	M
At the <i>Lizard</i> by the Land	07	30	At <i>Orkness</i> —————	03	00
At <i>Lambay</i> —————	08	15	At <i>Orkney</i> —————	09	00
At <i>Leystoft</i> , and thwart off			At <i>Orfordness</i> —————	09	45
it without the Banks —————	09	45	At <i>Orfordness</i> without the		
In <i>Leystoft</i> Road, and at			Banks, and between <i>Orford</i>		
<i>Long Sand-Head</i> —————	10	30	and <i>Orwell Waves</i> —————	10	30
			At <i>Orfordness</i> within the		
			Sands —————	11	15
M.			P.		
Within the <i>Maes</i> at <i>Mal-</i>			At <i>Portsmouth</i> half Tide	11	15
<i>don</i> —————	00	45	At the <i>Pens</i> , <i>Porthus</i> and		
Before the <i>Maes</i> —————	01	30	<i>Poictu</i> —————	03	00
At the <i>Maes</i> and before			On the Coast of <i>Portugal</i>	03	45
<i>St. Matthew's</i> Point —————	03	45	In <i>Plymouth</i> , and before		
In <i>Moufe-hole</i> , at <i>St. Mat-</i>			<i>St. Paul's</i> —————	05	15
<i>thew's</i> , & within <i>Mount's-Bay</i>	04	30	In the Haven at <i>St. Paul's</i>	06	00
In <i>Milford</i> , at <i>Moonless</i> and			Before <i>Podeffemeck</i> —————	06	45
at <i>St. Maloes</i> —————	05	15	Thwart of <i>Plymouth</i> —————	07	30
Between <i>Moufe-Hole</i> and			At the Race of <i>Portland</i>	09	00
<i>Falmouth</i> & in <i>Milford-Haven</i>	07	30			
In <i>St. Magnes</i> Sound and			Q.		
<i>Magnes</i> Castle —————	08	15	At <i>Quinborough</i> —————	12	00
At the <i>Ile of Man</i> —————	09	00			
Before <i>Margate</i> —————	11	15	R.		
N.			At <i>Rocheſter</i> —————	00	45
At <i>Newport</i> Half Tide —————	12	00	At <i>Ramkins</i> —————	01	30
At the West-end of the			At <i>Rotterdam</i> , in <i>Robin-</i>		
<i>Nore</i> —————	00	45	<i>hood's Bay</i> , and from the		
Before <i>Nantz</i> River —————	03	00	Race to the <i>Pole-Head</i> —————	03	00
At <i>Newcastle</i> —————	05	15	At <i>Rouen</i> , & before <i>Rockell</i>	03	45
Before <i>St. Nicholas</i> —————	06	45	In <i>Ramsay</i> —————	05	15
At the <i>Needles</i> , at the <i>Ile</i>			S.		
of <i>Wight</i> —————	08	15	In the <i>Sleeve</i> , between <i>U-</i>		
All the Coast of <i>Normandy</i>			<i>ſbant</i> and <i>Scilly</i> , at the <i>Sboe</i> ,		
and <i>Picardy</i> —————	10	30	at the <i>Spitts</i> , at <i>Southampton</i> ,		
Between the <i>Naze</i> and			and along the <i>Swin</i> —————	12	00
<i>Warhead</i> of <i>Lower</i> —————	11	15			

# A T I D E - T A B L E .

83

	H	M
Upon the Coast of Spain, and in Sbetland —————	03	00
At Scilly, in the Sound, Scarburgh, and at Staples —	03	45
At Seven Isles, without the Haven in the Broad-Sound —	04	30
At the Mouth of Severn, between Scilly and the Lizard, at the Spurn and Stockton —	05	15
Without Scilly, in the Channel, and at Salcomb —	06	00
At Sedmouth, & at the Start Off the Start in the Channel	06	45
Within the Seyn & before Shelburgh —————	07	30
At Shoreham —————	09	00
At Seyn-Head —————	09	45
	10	30
T.		
Within Tervere —————	00	45
Before Tervere, before the Thames and at Tinmouth —	01	30
Before the Tees & Tinmouth before the Bay of Tinmouth	03	00
At the Clifts of the Texell	04	30
In Torbay, and before the Texell —————	06	00
In the Road of the Texell —	07	30
At Torgen —————	09	45
U.		
Before Ureck —————	12	00
At Use —————	03	00
Between Ushant & the Main	03	45
In the Vourd, at the Bay, within Ushant —————	04	30

	H	M
Without Ushant —————	06	00
St. Vallery —————	10	30
W.		
At Winchelsey —————	00	45
At the Weilings, and from the West-end of the Wight —	01	30
Before the Weilings —	02	15
At Whitby —————	03	00
In the Sea of Wales and Severn —————	04	30
In Wales —————	05	15
At Wells, at Weymouth, & at Waterford —————	06	00
At Weymouth Key —————	06	45
At the Nefs, by Wiering- ben, at Winterton —————	07	30
Thwart of the Isle of Wight in the Channel, all within the Wight, between the Wight and Beachy by the Shore —	08	15
At the E. end of the Wight, and on Wieringben-Flats —	09	00
Y.		
Before Yarmouth —————	01	30
At Youghall —————	04	30
At Yarmouth —————	08	15
In Yarmouth Roads, and Yarmouth Haven —————	10	30
Z.		
On the Coast of Zealand	01	30
In the Zerick-Sea —————	03	00

M 2

The

Upon



*The Use of the TIDE-TABLE, in finding the Time of High-Water.*

**I**N this Table the Names of the Places being set in Alphabetical Order, they will always be found under the Letter they begin with, as for Example, *London*, will be found under the Letter L, *Torbay* under T, *Scilly* under S, &c. and the Figures right against any Place shews the Time of High-Water at that Place, on the Full and Change of the Moon.

Then if it be required to find the Time of High-Water at any Place upon any given Day, First (by the Tables of Numbers and Times answering) find the Number and Time answering for that Day, (as before Taught) and to that Time, add the Hours and Minutes that stand in the Tide-Table against the Place you would know the Time of High-Water at, the Sum, if it does not exceed 12 Hours, will be the Time of High-Water required; but if it should be more than 12 Hours, then subtract 12 from it, and the Remainder will be the Time of High-Water.

*Example.*

*Suppose it were required to find the Time of High-Water at London, on the 25th of January, 1760.*

By the Table of Numbers, I find the Number for the 25th of January, to be 17, with which Number entering the Table of Times, I find the Time answering to be 5 H. 36 M. then looking for *London*, in the Tide-Table, I find against it 3 Hours, which added to the Time before found, gives 8 H. 36 M. for the Time of High-Water at *London*, on the 25th of January, 1760.

*Example II.*

*Suppose it were required to find the Time of High-Water at St. Hellens, on the 5th of August, 1759.*

Having found the Number (as before) to be 22, and the Time answering to be 9 H. 36 M. I look in the Tide-Table under the Letter H, for *St. Hellens*, against which I find 10 H. 30 M. which added to the Time (as before) 9.36 gives 20.06, from which subtract 12.00, and the Remainder 8 H. 06 M. is the Time of High-Water required.

# A TABLE of the Sun's Declination for the Years 1761. 1765. 1769, and 1773.

M. Day	Jan.	Feb.	March	April	May	June	July	August	Sept.	Octob.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
1	22 59	16 57	07 24	04 44	15 14	22 08	23 08	17 58	08 09	03 22	14 37	21 55
2	22 54	16 40	07 01	05 07	15 32	22 16	23 03	17 42	07 47	03 45	14 56	22 05
3	22 48	16 22	06 38	05 31	15 50	22 24	22 59	17 27	07 25	04 08	15 15	22 13
4	22 42	16 04	06 14	05 54	16 07	22 31	22 54	17 11	07 03	04 31	15 34	22 21
5	22 35	15 56	05 51	06 17	16 24	22 38	22 48	16 55	06 41	04 54	15 52	22 29
6	22 28	15 27	05 28	06 39	16 41	22 44	22 42	16 38	06 19	05 18	16 10	22 36
7	22 20	15 08	05 05	07 02	16 58	22 50	22 35	16 21	05 56	05 41	16 28	22 43
8	22 11	14 49	04 41	07 24	17 14	22 55	22 28	16 04	05 33	06 04	16 45	22 49
9	22 03	14 30	04 18	07 46	17 30	23 00	22 21	15 47	05 10	06 27	17 02	22 55
10	21 54	14 11	03 54	08 08	17 45	23 05	22 14	15 29	04 47	06 49	17 19	23 00
11	21 45	13 51	03 30	08 30	18 01	23 09	22 06	15 11	04 24	07 12	17 36	23 05
12	21 35	13 31	03 06	08 52	18 16	23 13	21 58	14 53	04 01	07 35	17 52	23 10
13	21 25	13 11	02 42	09 14	18 31	23 17	21 49	14 35	03 38	07 58	18 08	23 14
14	21 14	12 50	02 19	09 35	18 45	23 20	21 40	14 17	03 15	08 20	18 24	23 17
15	21 03	12 29	01 55	09 57	19 00	23 22	21 31	13 58	02 52	08 42	18 39	23 20
16	20 51	12 08	01 32	10 18	19 14	23 24	21 21	13 39	02 29	09 04	18 54	23 23
17	20 39	11 48	01 08	10 39	19 27	23 26	21 11	13 20	02 06	09 26	19 09	23 25
18	20 27	11 27	00 44	11 00	19 40	23 27	21 00	13 00	01 43	09 48	19 24	23 27
19	20 14	11 05	00 21	11 21	19 53	23 28	20 49	12 41	01 20	10 10	19 38	23 28
20	20 01	10 43	No 02	11 41	20 06	23 29	20 38	12 21	00 56	10 32	19 51	23 29
21	19 48	10 22	00 26	12 02	20 18	23 29	20 27	12 01	00 39	10 54	20 04	23 29
22	19 34	10 00	00 50	12 22	20 30	23 29	20 15	11 41	00 09	11 15	20 17	23 29
23	19 20	09 38	01 14	12 42	20 41	23 28	20 03	11 21	Sou 14	11 36	20 30	23 28
24	19 05	09 16	01 37	13 02	20 52	23 27	19 50	11 00	00 38	11 57	20 42	23 27
25	18 50	08 54	02 01	13 21	21 03	23 25	19 37	10 39	01 01	12 18	20 54	23 25
26	18 35	08 31	02 24	13 40	21 14	23 23	19 24	10 18	01 25	12 38	21 05	23 23
27	18 20	08 09	02 48	14 00	21 24	23 21	19 10	09 57	01 48	12 59	21 16	23 20
28	18 04	07 46	03 11	14 19	21 34	23 18	18 56	09 36	02 12	13 19	21 26	23 17
29	17 48		03 35	14 38	21 43	23 15	18 42	09 15	02 35	13 39	21 36	23 13
30	17 31		03 58	14 56	21 52	23 11	18 27	08 53	02 58	13 58	21 46	23 09
31	17 14		04 21		22 01		18 12	08 31		14 17		23 05



# A TABLE of the Sun's Declination for the Years 1762. 1766. 1770, and 1774.

M. Day.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Octob.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
1	23 01 17	01 07 28	04 39 15	09 22 06	23 09 18	01 08 14	03 16 14	32 21 53				
2	22 56 16	44 07 05	05 02 15	27 22 14	23 04 17	46 07 52	03 39 14	51 22 02				
3	22 50 16	26 06 42	05 25 15	45 22 22	22 59 17	30 07 30	04 03 15	10 22 11				
4	22 43 16	08 06 19	05 48 16	03 22 29	22 54 17	14 07 08	04 26 15	29 22 19				
5	22 36 15	50 05 56	06 11 16	20 22 36	22 49 16	58 06 46	04 49 15	47 22 27				
6	22 29 15	32 05 33	06 33 16	37 22 42	22 43 16	42 06 24	05 12 16	05 22 34				
7	22 21 15	13 05 10	06 56 16	53 22 48	22 37 16	25 06 01	05 35 16	23 22 41				
8	22 13 14	54 04 46	07 18 17	09 22 54	22 30 16	08 05 38	05 58 16	41 22 47				
9	22 05 14	35 04 23	07 41 17	25 22 59	22 23 15	51 05 16	06 21 16	58 22 53				
10	21 56 14	15 03 59	08 03 17	41 23 04	22 16 15	33 04 53	06 44 17	15 22 59				
11	21 47 13	56 03 36	08 25 17	57 23 08	22 08 15	16 04 30	07 07 17	32 23 04				
12	21 37 13	36 03 12	08 47 18	12 23 12	22 00 14	58 04 07	07 30 17	48 23 09				
13	21 27 13	16 02 49	09 09 18	27 23 15	21 51 14	40 03 44	07 53 18	04 23 13				
14	21 16 12	55 02 25	09 30 18	42 23 18	21 42 14	21 03 21	08 15 18	20 23 16				
15	21 05 12	34 02 01	09 52 18	56 23 21	21 33 14	02 02 58	08 37 18	35 23 19				
16	20 54 12	13 01 37	10 13 19	10 23 23	21 23 13	43 02 35	08 59 18	50 23 22				
17	20 42 11	52 01 14	10 34 19	24 23 25	21 13 13	24 02 11	09 21 19	05 23 24				
18	20 30 11	31 00 50	10 55 19	37 23 27	21 03 13	05 01 47	09 43 19	20 23 26				
19	20 18 11	10 00 26	11 16 19	50 23 28	20 52 12	45 01 24	10 05 19	34 23 27				
20	20 05 10	49 00 02	11 36 20	03 23 29	20 41 12	25 01 01	10 27 19	48 23 28				
21	19 51 10	27 No 21	11 57 20	15 23 29	20 29 12	05 00 38	10 48 20	01 23 29				
22	19 37 10	05 00 44	12 18 20	27 23 29	20 17 11	45 00 14	11 09 20	14 23 29				
23	19 23 09	43 01 08	12 37 20	38 23 28	20 05 11	25 Sou 9	11 30 20	27 23 28				
24	19 09 09	21 01 32	12 57 20	49 23 27	19 53 11	05 00 32	11 51 20	39 23 27				
25	18 55 08	59 01 56	13 17 21	00 23 26	19 40 10	44 00 56	12 12 20	51 23 25				
26	18 40 08	37 02 19	13 36 21	11 23 24	19 27 10	23 01 19	12 33 21	02 23 23				
27	18 24 08	14 02 43	13 55 21	21 23 22	19 14 10	02 01 43	12 53 21	13 23 21				
28	18 08 07	51 03 06	14 14 21	31 23 19	19 00 09	41 02 06	13 13 21	24 23 18				
29	17 52		03 30 14	33 21 40	23 16 18	46 09 20	02 29 13	33 21 34	23 14			
30	17 36		03 53 14	51 21 49	23 13 18	31 08 58	02 52 13	53 21 44	23 10			
31	17 19		04 16	21 58		18 16 08	36 14 13		23 06			

# A TABLE of the Sun's Declination for the Years 1759. 1763. 1767, and 1771.

M. Day	Jan.	Feb.	March	April	May	June	July	August	Sept.	Octob.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
1	23 02	17 05	07 34	04 33	15 05	22 04	23 09	18 05	08 20	03 10	14 27	21 51
2	22 57	16 41	07 11	04 56	15 23	22 12	23 05	17 50	07 58	03 34	14 47	22 00
3	22 51	16 31	06 48	05 19	15 41	22 20	23 01	17 34	07 36	03 57	15 06	22 09
4	22 45	16 13	06 25	05 42	15 58	22 28	22 56	17 18	07 13	04 20	15 25	22 17
5	22 38	15 55	06 02	06 05	16 16	22 35	22 51	17 02	06 51	04 44	15 43	22 25
6	22 31	15 36	05 39	06 28	16 33	22 41	22 45	16 46	06 29	05 07	16 01	22 32
7	22 23	15 18	05 16	06 51	16 50	22 47	22 39	16 29	06 07	05 30	16 19	22 39
8	22 15	14 59	04 52	07 13	17 06	22 53	22 32	16 12	05 44	05 53	16 37	22 46
9	22 07	14 40	04 29	07 35	17 22	22 58	22 25	15 55	05 22	06 16	16 54	22 52
10	21 59	14 20	04 05	07 57	17 38	23 03	22 18	15 38	04 59	06 39	17 11	22 58
11	21 50	14 00	03 42	08 20	17 54	23 07	22 10	15 20	04 36	07 02	17 28	23 03
12	21 40	13 40	03 18	08 42	18 09	23 11	22 02	15 02	04 13	07 25	17 44	23 08
13	21 30	13 20	02 55	09 04	18 24	23 14	21 53	14 44	03 50	07 47	18 00	23 12
14	21 19	13 00	02 31	09 25	18 38	23 17	21 44	14 26	03 27	08 09	18 16	23 16
15	21 08	12 40	02 07	09 47	18 53	23 20	21 35	14 07	03 04	08 31	18 32	23 19
16	20 57	12 19	01 43	10 08	19 07	23 23	21 26	13 48	02 40	08 53	18 47	23 22
17	20 45	11 59	01 20	10 29	19 20	23 25	21 16	13 29	02 17	09 16	19 02	23 24
18	20 33	11 37	00 56	10 50	19 33	23 27	21 05	13 10	01 53	09 38	19 16	23 26
19	20 20	11 16	00 33	11 11	19 46	23 28	20 54	12 50	01 30	10 00	19 30	23 28
20	20 07	10 54	00 09	11 31	19 59	23 29	20 43	12 30	01 07	10 21	19 44	23 29
21	19 54	10 32	No 14	11 52	20 12	23 29	20 32	12 10	00 44	10 43	19 58	23 29
22	19 40	10 10	00 38	12 12	20 24	23 29	20 20	11 51	00 20	11 04	20 11	23 29
23	19 26	09 48	01 02	12 32	20 36	23 28	20 08	11 30	Sou 3	11 25	20 24	23 28
24	19 12	09 26	01 26	12 52	20 47	23 27	19 56	11 09	00 26	11 46	20 36	23 27
25	18 58	09 04	01 50	13 12	20 58	23 26	19 43	10 49	00 50	12 07	20 48	23 26
26	18 43	08 42	02 13	13 31	21 09	23 24	19 30	10 28	01 13	12 28	20 59	23 24
27	18 27	08 20	02 37	13 50	21 19	23 22	19 17	10 07	01 37	12 49	21 10	23 22
28	18 11	07 57	03 00	14 09	21 29	23 20	19 03	09 46	02 00	13 09	21 21	23 19
29	17 55		03 24	14 28	21 39	23 17	18 49	09 25	02 23	13 29	21 31	23 16
30	17 39		03 47	14 47	21 48	23 13	18 35	09 04	02 46	13 49	21 41	23 12
31	17 22		04 10		21 56		18 20	08 42		14 08		23 08



# A TABLE of the Sun's Declination for the Years 1760. 1764. 1768, and 1772.

M. Day	Jan.	Feb.	March	April	May	June	July	August	Sept.	Octob.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
1	23 03	17 09	07 16	04 50	15 19	22 10	23 07	17 53	08 03	03 28	14 42	21 58
2	22 58	16 52	06 53	05 13	15 37	22 18	23 02	17 38	07 41	03 52	15 01	22 07
3	22 52	16 35	06 30	05 36	15 54	22 25	22 57	17 22	07 19	04 15	15 20	22 15
4	22 45	16 17	06 07	05 59	16 11	22 32	22 52	17 06	06 57	04 38	15 39	22 23
5	22 39	15 59	05 44	06 22	16 28	22 39	22 46	16 50	06 35	05 01	15 57	22 31
6	22 33	15 41	05 21	06 45	16 45	22 45	22 40	16 33	06 12	05 24	16 15	22 38
7	22 26	15 23	04 58	07 08	17 02	22 51	22 34	16 16	05 50	05 47	16 33	22 45
8	22 18	15 04	04 34	07 30	17 18	22 56	22 27	15 59	05 27	06 10	16 50	22 51
9	22 10	14 45	04 11	07 52	17 34	23 01	22 20	15 42	05 04	06 33	17 07	22 56
10	22 01	14 25	03 47	08 14	17 50	23 06	22 12	15 24	04 41	06 56	17 24	23 01
11	21 52	14 05	03 24	08 36	18 05	23 10	22 04	15 06	04 18	07 19	17 40	23 06
12	21 42	13 45	03 00	08 58	18 20	23 13	21 55	14 48	03 55	07 41	17 56	23 10
13	21 32	13 25	02 37	09 20	18 35	23 17	21 46	14 30	03 32	08 03	18 12	23 14
14	21 22	13 05	02 13	09 42	18 49	23 20	21 37	14 11	03 09	08 25	18 28	23 18
15	21 11	12 45	01 49	10 03	19 03	23 23	21 28	13 53	02 46	08 48	18 43	23 21
16	20 59	12 24	01 25	10 24	19 17	23 25	21 18	13 34	02 23	09 10	18 58	23 23
17	20 48	12 03	01 01	10 45	19 31	23 27	21 08	13 15	02 00	09 33	19 13	23 24
18	20 36	11 42	00 38	11 06	19 44	23 28	20 57	12 55	01 36	09 55	19 27	23 25
19	20 23	11 21	00 14	11 27	19 57	23 29	20 46	12 36	01 13	10 17	19 41	23 27
20	20 10	10 59	No 09	11 47	20 09	23 29	20 35	12 16	00 49	10 38	19 54	23 29
21	19 57	10 38	00 33	12 07	20 21	23 29	20 24	11 56	00 26	10 59	20 07	23 29
22	19 44	10 16	00 56	12 27	20 33	23 29	20 12	11 35	00 02	11 20	20 13	23 29
23	19 30	09 54	01 20	12 47	20 44	23 28	19 59	11 15	Sou 21	11 41	20 32	23 28
24	19 16	09 31	01 44	13 07	20 55	23 27	19 46	10 54	00 44	12 02	20 44	23 26
25	19 01	09 09	02 08	13 27	21 06	23 25	19 33	10 33	01 08	12 23	20 56	23 24
26	18 46	08 47	02 31	13 46	21 16	23 23	19 20	10 12	01 31	12 43	21 08	23 22
27	18 31	08 25	02 54	14 05	21 26	23 20	19 06	09 51	01 55	13 04	21 19	23 20
28	18 15	08 02	03 17	14 24	21 36	23 17	18 52	09 30	02 18	13 24	21 30	23 17
29	17 59	07 39	03 41	14 43	21 45	23 14	18 38	09 09	02 41	13 44	21 40	23 13
30	17 43		04 04	15 01	21 54	23 11	18 23	08 47	03 05	14 04	21 49	23 09
31	17 26		04 27		22 02		18 08	08 25		14 23		23 04

# A TABLE of the Variation of the Sun's Declination, to every 10 Degrees of Longitude.

Degrees of Longitude from the Meridian of *London*.

Daily Varia.	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
Min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.
2	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
3	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
4	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2
5	0	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	2
6	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3
7	0	0	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	3
8	0	0	1	1	1	1	1	2	2	2	2	3	3	3	3	3	4	4
9	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
10	0	1	1	1	1	2	2	2	3	3	3	3	4	4	4	5	5	5
11	0	1	1	1	2	2	2	3	3	3	3	4	4	4	5	5	5	5
12	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6
13	0	1	1	1	2	2	2	3	3	4	4	4	5	5	5	6	6	6
14	0	1	1	2	2	2	3	3	3	4	4	5	5	5	6	6	7	7
15	0	1	1	2	2	3	3	3	4	4	5	5	5	6	6	7	7	7
16	0	1	1	2	2	3	3	4	4	5	5	5	6	6	7	7	8	8
17	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	7	8	8
18	1	1	2	2	3	3	4	4	5	5	6	6	7	7	7	8	9	9
19	1	1	2	2	3	3	4	4	5	5	6	6	7	7	7	8	9	9
20	1	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9	9	10
21	1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	9	10	10
22	1	1	2	2	3	4	4	5	6	6	7	7	8	9	9	10	10	11
23	1	1	2	3	3	4	4	5	6	6	7	8	8	9	10	10	11	11
24	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12

N

To



## To find the Sun's Declination, by the foregoing TABLES.

**E**ACH Page of the foregoing Tables contains the Sun's Declination for the four Years that it is mark'd with at the Top, and is divided into thirteen Columns; the first of which to the Left-Hand, shews the Day of the Month, and the other Twelve the Months of the Year, so that if it be required to find the Sun's Declination for any Day, as suppose for Example, on the 21<sup>st</sup> of *August*, 1759: First, I look for that Table that has 1759 at the Top of it, and then right against the 21<sup>st</sup> Day of the Month, and under *August*, I find 12, 10, which shews the Sun's Declination to be 12 Degrees 10 Minutes North; according to the Title at the Top of the Column.

The Sun's Declination in these Tables being calculated for the Meridian of *London*, if you should be considerably to the Eastward or to the Westward of *London*, it will cause some Alteration in it; to Correct which, the

Table of Variation of the Sun's Declination is to be used as follows.

*First*, Look out the Declination for the given Day of the Month, and for the Day following it, and subtract the lesser from the greater, the Remainder is the Daily Variation.

*Second*, Observe whether the Declination be increasing or decreasing, which you may know thus; if the Declination for the Day following the given Day be biggest, then it is increasing; but if it be least it is decreasing.

*Third*, Look for the Daily Variation in the first Column of the Table, and see what Number stands right against it, and under the given Degrees of Longitude; which Number is to be used as follows.

If the Difference of Longitude be Easterly, and the Declination increasing, it is to be subtracted from the Declination found in the Tables for the given Day; but if the Declination be decreasing it must be added.

If the Difference of Longitude be Westerly, and the Declination increasing, it must be added; but if the Declination be decreasing, it must be subtracted; the Sum in one Case, and the Remainder in the other will be the Sun's Declination in the Longitude required.

## A TABLE of the Sun's Right Ascension.

M. Day	Jan.	Feb.	March	April	May	June	July	August	Septem.	Octob.	Novem.	Dec.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	18 50	21 02	22 51	00 44	02 35	04 38	06 42	08 47	10 43	12 31	14 28	16 32
2	18 54	21 06	22 54	00 48	02 39	04 42	06 46	08 51	10 47	12 35	14 31	16 36
3	18 58	21 10	22 58	00 51	02 43	04 46	06 50	08 55	10 50	12 38	14 35	16 40
4	19 03	21 14	23 02	00 55	02 47	04 50	06 55	08 59	10 54	12 42	14 39	16 45
5	19 07	21 18	23 05	00 59	02 51	04 54	06 59	09 02	10 57	12 46	14 43	16 49
6	19 12	21 22	23 09	01 02	02 54	04 59	07 03	09 06	11 01	12 49	14 47	16 53
7	19 16	21 26	23 13	01 06	02 58	05 03	07 07	09 10	11 05	12 53	14 51	16 58
8	19 20	21 30	23 17	01 10	03 02	05 07	07 11	09 14	11 08	12 57	14 55	17 02
9	19 25	21 34	23 20	01 13	03 06	05 11	07 15	09 18	11 12	13 00	14 59	17 07
10	19 29	21 38	23 24	01 17	03 10	05 15	07 19	09 21	11 16	13 04	15 03	17 11
11	19 33	21 42	23 28	01 21	03 14	05 19	07 23	09 25	11 19	13 08	15 07	17 15
12	19 38	21 46	23 31	01 24	03 18	05 23	07 27	09 29	11 23	13 11	15 12	17 20
13	19 42	21 50	23 35	01 28	03 22	05 27	07 31	09 33	11 26	13 15	15 16	17 24
14	19 46	21 53	23 39	01 32	03 26	05 32	07 36	09 37	11 30	13 19	15 20	17 29
15	19 51	21 57	23 42	01 35	03 30	05 36	07 40	09 40	11 33	13 23	15 24	17 33
16	19 55	22 01	23 46	01 39	03 34	05 40	07 44	09 44	11 37	13 26	15 28	17 38
17	19 59	22 05	23 50	01 43	03 38	05 44	07 48	09 48	11 41	13 30	15 32	17 42
18	20 04	22 09	23 53	01 46	03 41	05 48	07 52	09 52	11 44	13 34	15 36	17 46
19	20 08	22 13	23 57	01 50	03 45	05 52	07 56	09 55	11 48	13 38	15 40	17 51
20	20 12	22 17	00 00	01 54	03 49	05 57	08 00	09 59	11 51	13 41	15 45	17 55
21	20 16	22 20	00 04	01 58	03 53	06 01	08 04	10 03	11 55	13 45	15 49	18 00
22	20 20	22 24	00 07	02 01	03 57	06 05	08 08	10 06	11 59	13 49	15 53	18 04
23	20 25	22 28	00 11	02 05	04 01	06 09	08 12	10 10	12 02	13 53	15 57	18 09
24	20 29	22 32	00 15	02 09	04 06	06 13	08 16	10 14	12 06	13 57	16 02	18 13
25	20 33	22 36	00 19	02 13	04 10	06 17	08 20	10 17	12 09	14 00	16 06	18 18
26	20 37	22 39	00 22	02 16	04 14	06 22	08 23	10 21	12 13	14 04	16 10	18 22
27	20 41	22 43	00 26	02 20	04 18	06 26	08 27	10 25	12 17	14 08	16 14	18 26
28	20 45	22 47	00 30	02 24	04 22	06 30	08 31	10 28	12 20	14 12	16 19	18 31
29	20 49		00 33	02 28	04 26	06 34	08 35	10 32	12 24	14 16	16 23	18 35
30	20 54		00 37	02 31	04 30	06 38	08 39	10 36	12 27	14 20	16 27	18 40
31	20 58		00 40		04 34		08 43	10 39		14 24		18 44



A TABLE of the Right Ascension and Declination  
of some of the most Noted Fixed Stars.

The Names of the Stars.	Right Ascen.		Declina- tion.	
	H.	M.	D.	M.
<i>The Bright Star of Aries</i> —————	01	53	22	17 N
<i>Medusa's Head, Algol</i> —————	02	52	39	59 N
<i>The bright side of Perseus</i> —————	03	07	48	58 N
<i>The Bull's Eye, Aldebaran</i> ————	04	22	15	59 N
<i>The Goat Star, Capella</i> —————	04	59	45	43 N
<i>The Bright Foot of Orion, Regel</i> ———	05	01	08	28 S
<i>The Northern Horn of the Bull</i> ———	05	09	28	21 N
<i>Orion's Left Shoulder</i> —————	05	10	06	04 N
<i>The Southern Horn of the Bull</i> ———	05	21	20	56 N
<i>Middle Star in Orion's Belt</i> —————	05	22	01	25 S
<i>Orion's Right Shoulder</i> —————	05	52	07	20 N
<i>Auriga's Right Shoulder</i> —————	05	44	44	54 N
<i>Bright Foot of Gemini</i> —————	06	20	16	38 N
<i>The Dog Star, Sirius</i> —————	06	34	16	23 S
<i>Castor, or the Head of the Northernmost Twin</i> —	07	17	32	24 N
<i>The little Dog Star, Procyon</i> ————	07	24	05	49 N
<i>Pollux, or the Head of the Southernmost Twin</i> —	07	28	28	36 N
<i>Hydra's Heart</i> —————	09	16	07	37 S
<i>The Lyon's Heart, Regulus</i> —————	09	53	13	09 N
<i>The Lower of the Pointers</i> —————	10	45	57	41 N
<i>The Upper of the Pointers</i> —————	10	46	63	03 N
<i>The Lyon's Tail, Deneb</i> —————	11	35	15	55 N
<i>Upper of the two last in the square of Great Bear</i>	12	02	58	35 N
<i>The First in the Great Bear's Tail</i> ———	12	41	57	18 N
<i>The Virgin's Spike</i> —————	13	12	09	52 S
<i>The middle of the Three in the Great Bear's Tail</i>	13	11	56	22 N
<i>Last but one in the Tail of Hydra</i> ———	13	04	21	43 S
<i>Last in the Great Bear's Tail</i> —————	13	36	50	31 N
<i>Arcturus</i> —————	14	03	20	30 N
<i>Bright Star in the Southern Ballance</i> ———	14	35	14	53 S
<i>Foremost Guard</i> —————	14	51	75	15 N

Bright

## A TABLE of the Fixed Stars.

The Names of the Stars.	Right Ascen.		Declination.	
	H.	M.	D.	M.
<i>Bright Star of the Crown</i> —————	15	22	27	33 N
<i>Bright Star in the Serpent's Neck</i> —————	15	31	07	18 N
<i>The Scorpion's Heart, Antares</i> —————	16	14	25	51 S
<i>The Head of Hercules</i> —————	17	03	14	40 N
<i>In the Head of Serpentarius</i> —————	17	22	12	47 N
<i>Bright Star in the Dragon's-Head</i> —————	17	50	51	32 N
<i>Lyræ, or the Harp</i> —————	18	27	38	33 N
<i>Swan's Beak</i> —————	19	17	27	29 N
<i>Bright Star in the Eagle</i> —————	19	39	08	14 N
<i>The Swan's Tail</i> —————	20	33	44	19 N
<i>Pegasus's Mouth</i> —————	21	27	08	39 N
<i>Fomelbaut</i> —————	22	42	30	55 S
<i>Pegasus's Wing, Marchab</i> —————	22	53	13	53 N
<i>Pegasus's Leg, Scheat</i> —————	22	52	26	43 N
<i>Cephus's Knee</i> —————	23	20	76	07 N
<i>The Head of Andromeda</i> —————	23	54	27	34 N
<i>End of Pegasus's Wing, Algenib</i> —————	23	58	13	39 N
<i>Pole Star</i> —————	00	42	88	00 N
<i>Girdle of Andromeda</i> —————	00	53	34	05 N

A TABLE of the Right Ascension and Declination of the *Crofters*.

	Right Ascen.		Declination.	
	H.	M.	D.	M.
<i>The Westernmost of the two middle Stars</i> —————	12	01	57	11 S
<i>The Easternmost</i> —————	12	33	58	06 S
<i>The Northernmost or highest Star</i> —————	12	16	55	30 S
<i>The Southernmost or Lowest</i> —————	12	12	61	31 S

To



To work an Observation, Or, to find the Latitude of the Place by the Tables of the Sun or Stars Declination, and their Zenith Distance, &c.

*Note,* **W**HEN you take an Observation of the Sun, by the common Sea-Quadrant, the Degrees and Minutes that your sight Vane stands at, being added, to the Degrees that your Shade or Glass Vane stands at, will give the Zenith Distance (or Complement of the Meridian Altitude) with which and the Declination found in the Tables, you may find the Latitude as follows.

*First,* Take Notice whether the Sun or Star be to the Northward or to the Southward of you at the Time of Observation; if they are to the Northward, call your Zenith Distance North; or if they are to the Southward, call it South. Then,

*Second,* If the Zenith Distance and Declination are both North, or both South, subtract the lesser from the greater, the Remainder will be the Latitude you are in, of the same Name with the Declination, if that be greater than the Zenith Distance, otherwise of a contrary Name.

*Example 1st,* Being at Sea on the 23<sup>d</sup> of August, 1759, I observed at Noon, and had on my Quadrant 8.34, (and the Sun to the Northward of me) what Latitude am I in?

Zenith Distance	_____	8.34 North
Declination	_____	11.30 North
Latitude by Observation	_____	2.56 North

*Example 2d,* Being at Sea on the 23<sup>d</sup> of December, I took the Altitude of the Dog Star *Syrius*, (on the Meridian to the Southward of me) 60.00. I would know the Latitude?

*Note,* In all Cases (except where the Object is observed on the Meridian below the Pole) if the Meridian Altitude be given instead of the Zenith Distance, (as it is in this Example) then subtract it from 90.00, and the Remainder will be the Zenith Distance.

Meridian Altitude from 90.00, leaves the Zen. Dist.	30.00 South
Star's Declination, (by the Table)	16.23 South
Latitude by Observation	13.37 North

To

## To work an Observation.

*Case the 2d,* If the Zenith Distance and Declination be one North, and the other South, add them together, and their Sum will be the Latitude in, of the same Name with the Declination.

*Example 1st,* Being at Sea on the 3d of November, 1759, I observed at Noon, and had on my Quadrant 8.17, (and the Sun to the Northward of me) I demand the Latitude?

Zenith Distance	_____	08.17 North
Declination	_____	15.06 South
Latitude by Observation	_____	23.23 South

*Example 2d,* Being at Sea on the 21st of June, 1753, I took the Altitude of the Bright Star in the *Harp, Lyrae*, (on the Meridian to the Southward of me) 51.00. I demand the Latitude?

Complement Altitude, or Zenith Distance	_____	39.00 South
Star's Declination	_____	38.33 North
Latitude by Observation	_____	77.33 North

The foregoing Rules are for observing by the Sun or Stars, when they are at their greatest Altitude, or upon the Meridian above the Pole; but as in some Parts of the Earth the Sun does not set for several Days, and some Stars never set; in that Case they may be observed upon the Meridian, twice in the 24 Hours, that is, once at their greatest Height (as before) and again, when they are at the lowest, or upon the Meridian below the Pole; to work which Observation take the following Rule.

Add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude of the same Name with the Declination.

*Example,* Being at Sea I took the Altitude of the Pole Star on the Meridian below the Pole, 46.21, I demand the Latitude?

Meridian Altitude	_____	46.21
Complement Declination	_____	02.00 North
Latitude by Observation	_____	48.21 North

The



**The Use of the TABLES of the Sun's and Stars**  
Right Ascension, in finding what Time any known Star  
will be upon the Meridian, on any given Day.

*Rule,* Look for the Right Ascension of the Sun and Star in the foregoing Tables, and subtract the Sun's Right Ascension from the Star's; but if the Sun's Right Ascension be biggest, add 24 Hours to the Star's Right Ascension, and then subtract the Sun's from it, the Remainder will be the Time of the Star's coming to the Meridian, after Noon.

*Example 1st,* What Time will the *Lion's Tail* be upon the Meridian, on the 14th of April? h. m.

Star's Right Ascension \_\_\_\_\_ 11.35

Sun's Right Ascension \_\_\_\_\_ 01.32

Time the Star will be on the Meridian \_\_\_\_\_ 10.03 at Night

*Example 2d,* What Time will the *Bull's-Eye* be on the Meridian, on the 26th of October?

Star's Right Ascension 4h. 22m. add 24h. makes 28.22

Sun's Right Ascension \_\_\_\_\_ 14.04

Time the Star will be on the Meridian \_\_\_\_\_ 14.18 Afternoon,  
that is, at 18m. past 2 in the Morning.

To find what Star will come upon the Meridian, at any given Time.

*Rule,* Add the Time from Noon, to the Right Ascension of the Sun, the Sum will be Right Ascension of the Star required to be known, with which enter the Table of the Star's Right Ascension, and find what Star's Right Ascension agrees with, or comes the nearest to it, and that is the Star required.

*Example 1st,* I would know what Star will be on the Meridian, about Eight at Night, on the 7th of April. h. m.

Sun's Right Ascension \_\_\_\_\_ 01.06

Time from Noon \_\_\_\_\_ 08.00

Right Asc. of the req. Star, the nearest to which 09.06 is *Hydra's Heart*

*Example 2d,* I would know what Star will be on the Meridian, at 2 past 2 in the Morning, on the 26th of June. h. m.

Sun's Right Ascension \_\_\_\_\_ 06.22

Time from Noon \_\_\_\_\_ 14.15

Rt. Asc. of req. Star, nearest to which in the Tables 20.37 is *Swan's Tail*

# A TABLE of the Latitudes and Longitudes of Places, accounting the Longitudes from the Meridian of *L O N D O N*.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
	D.	M.	D.	M.		D.	M.	D.	M.
<i>The Coast of England.</i>									
<b>B</b> erwick	55	48	01	45 W	Aberdeen	57	24 N	01	40 W
Newcastle	55	12	01	30 W	Dundee	56	28 N	02	40 W
Stockton	54	33	01	25 W	Edenburg	55	58 N	02	59 W
Spurn	53	45	00	13 E	<i>The Coast of Ireland.</i>				
Yarmouth	52	40	01	40 E	Dublin	53	12	06	56
London	51	32	00	00	Wexford	52	13	07	27
North Foreland	51	25	01	24 E	Waterford	52	09	08	40
Beachy Head	50	46	00	25 E	Cork	51	49	09	30
Dunnose	50	38	01	23	Cape Clear	51	17	11	10
Portland	50	30	02	44	Limerick	52	23	09	35
Start	50	07	03	47	Galway	53	07	09	40
Lizard	49	57	05	14	Slieve Head	53	20	11	15
Land's End	50	06	06	00	Londonderry	55	00	07	50
St. Mary Scilly	49	57	06	10	Belfast	54	39	06	30
Hartland Point	51	06	04	35	<i>The Coast of Holland and Flanders.</i>				
Lundy Isle	51	20	04	40	Scaw	57	30	10	20
Bristol	51	33	04	35	Helighland	54	24	08	35
St. David's Head	51	00	05	22	Hambrough	53	41	10	35
Barsey Isle	52	44	05	00	Emden	53	05	07	35
Holy-head	53	23	04	50	The Fly	53	15	05	30
Liverpool	53	20	03	00	The Texel	53	15	05	10
Whitehaven	54	25	03	30	Amsterdam	52	23	05	04
Carlisle	54	47	03	05	Rotterdam	51	55	04	30
<i>The Coast of Scotland.</i>					The Brill	52	00	04	00
Glasgow	55	52	04	05	Sluice	51	14	03	43
N. Part of Sky Isle	57	45	05	45	Calais	50	58	01	54
N. Part of Lewis Isle	58	20	07	20	<i>The Coast of France and Portugal.</i>				
St. Kilday	57	52	09	45	Diep	49	56 N	01	09 E
Farra Head	58	34	05	10	Cape de Hague	49	47 N	02	00 W
Isles of Orkney	59	10	03	22	Gaskets	49	50 N	02	20 W
Shetland S. Point	60	04	02	00	Guernsey	49	33 N	02	20 W
Buchanefs	57	45	01	18					



## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
	D.	M.	D.	M.		D.	M.	D.	M.
<i>The Coast of France and Portugal.</i>									
Morlaix	48	33	03	49	Ancona	43	40	14	26
Ushant	48	30	05	02	Venice	45	25	12	10
Brest	48	23	04	25	Lepanto	38	10	22	52
Penmark	47	48	04	24	Cape Matapan	36	33	22	41
Bell Isle	47	20	03	16	Cape St. Angelo	36	32	23	56
Nantz	47	14	01	39	Athens	37	58	24	05
Island Dieu	46	34	02	13	Cape Martelo S.	38	07	25	03
Isle of Ree	46	10	01	30	part of Negropont				
Rochel	46	10	01	11	Cape Monte Sancto	40	26	25	02
Bourdeaux	44	50	00	38	Gallipoly	40	33	27	20
Bilboa	43	29	02	58	Constantinople	40	59	28	56
Cape Ortegal	44	04	07	48	Smyrna	38	28	27	25
Cape Finister	43	12	09	40	Ephesus	38	01	27	53
Oporto	41	10	09	25	Antiocheta	36	30	32	46
Burlings	39	35	09	24	Scanderoon	36	34	36	30
Rock of Lisbon	38	54	09	50	Tripoli	34	38	36	15
Cape St. Vincent	36	53	09	06	Alexandria	31	10	30	19
Cadiz	36	33	06	01	Cape Rufato	32	48	21	25
Cape Trefalgar	36	10	06	01	Cape Miserato	32	21	16	17
<i>On the Main Continent within the Straits.</i>					Tripoly	32	54	13	10
Gibraltar	36	12	04	53W	Cape Bona	37	03	11	04
Cape de Gat	36	40	01	40W	Bona	37	02	08	19
Cape Paul	38	15	00	05	Algier	37	05	03	16
Cape Martin	38	46	00	40	Cape de Tres Forcas	35	30	02	04W
Barcelona	41	26	02	18	Tetuan	35	27	05	06W
Marseilles	43	18	05	27	Ceuta	35	54	04	45W
Toulon	43	07	06	02	Tangier	35	42	05	22W
Genoa	44	25	08	43	<i>Islands within the Straits.</i>				
Leghorn	43	28	10	35	Alboran	35	54	02	29W
Rome	41	54	12	45	Formentaria	38	33	01	55
Naples	40	51	14	46	Yvica	38	50	01	40
Cape Sparteventuro	37	55	16	55	Majorca City	39	30	03	03
Cape Collone	38	56	18	05	Port Mahon	39	42	04	12
Gallipoli	39	56	18	43	Gallita	37	41	08	44
Cape St. Mary	39	45	19	00	S. end of Sardinia	38	46	09	12
					N. end of Corfica	42	56	09	50

## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
Islands within the Straits.	D.	M.	D.	M.		D.	M.	D.	M.
Gorgona —————	43	34	09	38	Affinee —————	04	15	02	17 W
Captia —————	43	03	14	54	Cape 3 Points ———	04	28	01	50 W
Lilboa —————	42	45	11	00	River Volta —————	05	55	03	25
Messina —————	38	07	16	20	River Formosa ———	07	00	07	20
Maritimo —————	38	12	17	09	Cape Formosa —————	04	15	06	40
Cape Passaro ———	36	38	15	40	New Callabar ———	04	42	08	33
Malta —————	35	53	14	32	Old Callabar ———	04	10	09	45
Corfu —————	39	42	20	06	River Camaroons —	03	25	10	10
Zephalonia ———	38	15	21	00	River Angra —————	00	50	10	01
Zant —————	37	46	21	14	Cape Lopez —————	00	55	09	55
Morea —————	36	52	21	32	River Congo —————	05	40	15	25
Lemnos —————	39	59	25	37	Angola —————	08	57	15	56
Scio —————	38	22	26	12	Cape Negro —————	16	08	12	31
C. St. John West } end of Candia	35	15	24	00	Cape St. Thomas —	24	10	14	43
Cape Solomon East } end of Candia	35	00	27	08	Cape Bona Esperance	34	07	19	35
City of Rhodes ———	36	42	28	05	Western Islands.				
West end of Cyprus	34	57	32	23	Corvo —————	39	54	30	55
East end of Cyprus	35	31	35	00	Flores —————	39	32	30	54
The Coast of Barbary and Guiney.					Fial —————	38	53	28	15
Cape Spartel ———	35	50	05	49	Pico —————	38	40	27	20
Sallee —————	33	51	06	25	St. George ———	38	52	26	03
Cape Cantin ———	32	36	09	10	Tercera —————	38	57	25	34
Cape de Geer ———	30	04	10	56	St. Michael ———	38	06	23	36
Cape Bajadore ———	26	04	15	35	St. Maries ———	36	59	23	38
Cape Olerado ———	23	41	15	50	The Canary Islands.				
Cape Blanco ———	20	32	17	35	Ferro —————	27	54	17	45
Senegal —————	15	28	16	25	Palma —————	28	40	17	36
Cape de Verde ———	14	43	17	20	Gomera —————	28	06	17	05
River Gambia ———	13	08	15	31	Tenariff —————	28	23	16	28
Sierralion ———	08	36	12	57	Madera West end —	32	44	17	26
Cape Monserado ———	06	05	10	02	Porto Sancto ———	33	12	15	54
Cape Palmas ———	04	13	06	45	Canaria —————	27	52	15	10
Jaque, Jaque ———	04	16	02	47	Forteventura ———	28	05	13	36
					Lancerota ———	29	02	12	45



## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude	Longitude	Places Names.	Latitude	Longitude
	D. M.	D. M.		D. M.	D. M.
Cape de Verde Islands.					
St. Vincent	17 04	24 39	Vifegapatam	17 43	83 57
St. Lucia	17 00	24 30	Cape Palmiras	20 42	87 52
St. Nicholas	16 50	23 48	Bengal	22 17	92 21
Brava	14 28	24 02	Cape Negrais	16 23	93 00
Fuego	14 50	23 41	Malacca	02 21	102 10
St. Jago	15 08	22 56	Siam Entrance	14 18	100 55
Isle of May	15 14	22 02	Cambodia Entrance	10 28	110 34
Isle Sal	16 50	22 08	Cochin	14 05	107 56
Bonavista	16 05	22 07	Canton	23 14	113 06
			Amoy or Quemoy	24 35	116 50
			Lampo	29 59	120 35
			Nanquin	32 55	120 01
The Southern Islands.			Islands in the East-Indies.		
St. Matthews	01 30 S	06 01 W	Madagascar } S. end	25 47	46 10
Ascension	07 40 S	14 25 W	or St. Lawrence } N. end	12 10	51 05
St. Hellena	16 00 S	06 14 W	Mayetta	13 10	45 38
Fernandepo	02 40 N	10 30 E	Mohilla	12 05	44 23
Princes	01 40 N	09 15 E	Comeró	11 40	43 50
St. Thomas	00 00	08 20 E	St. Juan de Nova	16 30	42 40
Annabona	02 10 S	07 27 E	Mauritius	20 10	52 55
The Coasts on the Main Continent in the East-Indies.			Digo Royes	19 50	61 30
Cape Lagulias	34 54 S	21 20	Romiras de } S. end	28 45	67 17
Cape Corientes	23 40 S	36 17	Castelamos } N. end	38 40	72 45
Mofambique	15 04 S	41 10	Amsterdam	16 38	64 30
River de Fugos	00 14 S	41 15	St. Brandon	08 40	68 25
Cape Bassos	04 06	47 38	Diego Gratiosa	03 53	52 36
Cape Guardafoy	11 44	51 20	Quabella	06 55	68 45
Cape Rosulgat	22 41	59 45	Bassos de Chagos	00 20	72 00
Cape Muca	23 32	59 45	Yas de Diego Rays	07 14	73 04
Bussera	29 45	49 20	Maldivia } S. end	00 25	76 22
Surrat	21 10	72 25	Malique	09 00	72 58
Goa	15 31	73 50	Sacatra	12 21	54 05
Callicutt	11 16	75 30	Abdeleur	12 04	53 04
Cochin	09 54	75 55			
Cape Comarine	07 50	77 25			
Fort St. George	13 11	80 32			
Dew Point	16 08	81 32			

## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
	D.	M.	D.	M.		D.	M.	D.	M.
<i>Islands in the East-Indies.</i>					<i>The Coast of America in the South-Sea.</i>				
C. Gallo, in Zeloan	06	07	81	15	Cape St. Sebastians	42	45	127	55
Yas de Amber	00	00	52	30	Cape St. Lucia	23	20	111	40
Andaman	12	10	93	32	Cape Corientes	19	40	109	30
Nicobar	07	11	93	40	Aquapulco	17	05	104	18
Sumatra NW. end	05	22	94	50	Aquatulco	15	27	102	03
Verkins Island	02	22	94	07	Guatemala	14	25	101	00
Nassau Island	02	54	99	32	Panama	08	50	81	52
Bencola	03	55	104	08	Bay Bonaventura	03	24	78	06
Sumatra SE. end	05	22	105	10	Isle Gallopega	00	00	90	10
Engano	05	50	101	43	Cape del Ajugo	06	30	84	50
Selam	08	20	102	13	Lima	12	15	77	30
Princes Island	06	30	104	02	Arica	18	29	73	10
Bantam in Java	06	11	105	55	La Serena	29	00	76	22
Batavia	06	16	106	46	I. Juan Fernando	33	15	83	18
Java E. end	08	32	113	30	Baldivia	39	35	81	10
Straits of Sundy	06	02	105	46	Port Steven	46	50	82	36
Banca S. end	03	20	106	45	Cape Victory	52	00	83	10
Borneo S. point	03	54	113	37	Cape Horn	57	58	79	55
Bandy Isles	04	55	127	17					
Celebes { S. end	05	10	119	07	<i>The Coast of Brazil from Cape Horn to Cape Roque.</i>				
{ N. end	01	40	121	20					
Mindano W. point	06	40	119	15	Magellan E. entr.	52	00	75	05
Borneo N. point	07	10	113	05	River Julian	48	40	74	34
Luconia { S. point	12	30	120	10	Cape Blanco near	46	50	72	07
{ NE. point	18	35	120	05	River Camaroons				
Anian { W. point	19	30	107	00	Buenos Ayres or	36	10	57	54
{ E. point	19	55	109	55	River Plate				
Formosa { S. point	22	00	119	56	River Grand	31	55	52	00
{ N. point	25	30	120	45	St. Katherine's	27	50	49	00
Piscadore Isles	23	30	118	35	Cape Frio	23	00	42	20
Island Chufan	30	38	120	35	Spirito Sancto	19	59	42	10
Japan { SE. point	35	30	140	30	P. Segura	16	31	40	35
{ SW. point	35	00	128	30	Bay Todos Santos	12	46	41	00
					River St. Francisco	10	50	37	50



## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
The Coast of Brazil, &c.	D.	M.	D.	M.		D.	M.	D.	M.
Cape St. Augustine—	08	35 S	35	20W	St. Bartholomew —	17	52	62	06
Cape Roque—	05	00 S	35	47W	St. Martins —	18	06	62	10
Tristian de Cunha—	37	05 S	10	24W	Anguilla —	18	17	62	13
Trinidad—	20	30 S	30	00W	Virgins —	18	30	63	25
Main Continent in the <i>West-Indies</i> .					St. Cruz —	17	52	63	30
					Bieque —	18	00	63	15
					Porto Rico St. Johns	18	30	65	37
					St. Domingo Hisp.	18	25	69	30
					Port Royal Jamaica	17	40	76	32
					East end of Cuba —	20	15	73	55
					Havanna —	22	40	82	55
					Bay of Hondy —	22	45	83	40
					Cape St. Antony —	21	45	85	32
					<i>Bahama Islands.</i>				
The Caribbee Islands.					Bermudas —	32	25	63	40
					N. point of Baha- ma Bank —	28	00	78	35
					Bahama Island —	26	50	79	36
					Abacco S. point —	26	00	73	46
					Harbour Island —	25	37	76	47
					Andros N. point —	25	10	78	50
					Providence —	25	00	77	20
					Illathera St. point —	24	40	75	56
					Cat Island —	24	25	75	09
					Watling Island —	24	03	74	35
					Rum Key —	23	45	74	50
					Exuma —	23	22	75	55
					Crooked Island N. point —	22	56	74	12
					Atkins Key —	22	17	74	05
					Metaparovouz —	21	58	74	45
Trinidad—	10	15	60	17	Atwoods Key —	23	10	73	35
Tobago W. end —	11	10	59	10	French Keys —	22	40	73	40
Granado —	11	57	60	20	Mayaguana —	22	35	72	46
Barbadoes —	12	58	58	50	Hogsties —	21	17	73	55
St. Vincent —	13	12	60	12					
St. Lucia —	13	55	60	04					
Martinico —	14	43	60	54					
Dominico —	15	23	60	30					
Marigallante —	15	58	60	20					
Guardalupe —	16	10	61	15					
Monserat —	16	45	62	15					
Antigua —	17	05	61	45					
Nevis —	17	05	62	32					
St. Christophers —	17	17	62	40					
Barbuda —	17	56	60	40					

## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude	Longitude	Places Names.	Latitude	Longitude
	D. M.	D. M.		D. M.	D. M.
<i>Bahama Islands.</i>			<i>The Coast of Hud- son's Bay and Straits</i>		
Heneago ———	20 52 N	73 46 W	Buttons Isle ———	60 25	66 27
Caicos Bank N. } point ——— }	21 50 N	71 15 W	Cape Charles ———	62 10	75 35
Turks Island ———	21 35 N	70 08 W	Cape Walsingham —	62 35	77 55
Abrolho N. point —	21 35 N	69 06 W	Mansfield Isle ———	61 42	80 30
Plate Wreck ———	20 10 N	68 15 W	Cape Jones ———	54 55	78 58
<i>The Coast of Carolina, Virginia, Mary- land, Pennsylvania, New-England, and Newfoundland.</i>			Ruperts River ———	51 30	79 26
			Albany River ———	52 26	84 50
			The Cubbs ———	54 10	82 40
			C. Henrietta Maria	55 07	84 30
			Port Nelson ———	57 10	93 58
			Cape Churchill —	59 00	95 20
			Cape Southampton	61 55	86 48
			Shark point ———	64 30	82 55
			Nottingham Isle —	63 30	79 53
			Q. Ann's Foreland	63 48	74 45
Charles Town up- on Ashly River }	32 45	78 46	Resolution Isle —	61 50	65 04
Cape Hatteras ———	35 15	74 20	Cape Farewell ———	59 45	46 45
Cape Henry ———	37 00	75 24	<i>The Coast of Iceland, Greenland, Nova Zembla, and Northern Isles.</i>		
Cape Charles ———	37 16	74 16			
Cape Hinlopen ———	38 50	74 56			
Long Island ———	40 50	72 45			
New York ———	40 58	73 53			
Cape Cod ———	42 12	68 55			
Boston ———	42 30	69 23			
Cape Sable ———	43 50	64 58			
Isle Sable ———	44 20	59 01			
Cape Britain ———	46 00	58 30			
Quebec ———	46 55	69 48	Sound Royal ———	66 22	14 33
Bay of Brest ———	52 10	56 57	Bargazar point ———	66 20	16 35
Bell Island ———	52 07	55 35	Whales Back ———	65 27	20 33
Cape St. John ———	50 15	52 48	Merchants Foreland	63 25	17 05
Cape Bonavista ———	49 15	52 12	Halliford ———	64 30	34 43
Trinity Bay Entr.	48 42	32 20	Fair Foreland ———	66 20	26 27
Conception Bay —	48 20	52 08	Grims Island ———	67 15	22 34
St. John's Harbour	48 00	51 39	Westmania Isles —	63 30	22 24
Bay of Bulls ———	47 50	51 29	Isles of Fero ———	62 06	05 00
Cape Race ———	46 40	51 52	Beerenberg, or }	North Latitude.	West Longitude.
Cape St. Mary ———	47 10	53 23	John Main's Isle }		
Placentia ———	47 45	53 58	Point Look-out —		
Cape Roy ———	48 00	57 40	Horn Sound ———		
			Fair Foreland ———		
			Hacluits Foreland —		
			Helie's Sound ———		



## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
	D.	M.	D.	M.		D.	M.	D.	M.
The Coast of <i>Iceland</i> , <i>Greenland</i> , <i>Nova-</i> <i>Zembla</i> , and Nor- thern Isles.									
Lees Foreland —	78	05	23	25	Gottenburgh —	57	50	12	15
Whales Head —	77	18	21	30	Elfinore —	56	22	12	42
Hope Island —	76	18	23	45	Copenhagen —	55	41	12	50
Cherry or Bear Isle	74	30	18	08	Valsterborn —	55	28	13	00
Admiralty Isle —	75	05	54	50	Kalmer —	56	40	16	35
Fretum Borough —	70	00	61	20	Stockholm —	59	20	19	30
Cape Candinose —	69	05	42	35	Wybourg —	60	52	29	16
Catnose —	65	43	35	14	Petersburg —	60	00	30	25
Archangel Bar —	64	30	40	30	Narva —	59	27	28	25
Cross Island —	66	31	36	33	Revel —	59	25	24	51
Sweetnose —	68	10	34	45	Riga —	57	04	25	15
Kilduyn —	69	30	31	20	Derwindz —	57	15	22	06
North Cape —	71	23	23	02	Koningsberg —	54	43	21	35
Surroy —	71	05	16	40	Dantzick —	54	22	18	30
Tronifound —	70	25	15	30	Wisby in Gotland —	57	30	18	30
Leifort SW. point —	68	15	09	30	Bornholm —	55	15	14	45
Dronthon —	63	50	10	15	Straelifound —	54	25	13	16
Stadland —	62	10	04	38	Lubeck —	54	06	09	55
North Bergen —	60	10	05	40	Anout —	56	50	11	06
Naze of Norway —	57	45	12	39	Lefou —	57	05	10	30
					Scaw —	57	30	10	20
The Coast in the <i>Sound</i> and <i>Baltick</i> .									
Mardou —	58	19 N	08	57 E					
Larwick —	58	54 N	09	20 E					
Christiana —	59	20 N	10	00 E					
Maesterland —	57	53 N	11	45 E					

The Latitudes of any two Places being given, to find the Difference of Latitude between them.

*Rule*, If the Latitudes are both North, or both South, subtract the Lesser from the Greater, the Remainder will be the Difference of Latitude.

But

## Rules for Latitude.

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But if one Latitude be North, and the other South, then add them together, and their Sum will be the Difference of Latitude.

*Example 1st.* What is the Difference of Latitude between the *Lizard* and *Barbadoes*.

Lizard, in Latitude— — — —	49° 57' N.
Barbadoes, in Latitude — — — —	12 58 N.
The Difference of Latitude— — —	36 59

*Example 2d.* What is the Difference of Latitude between *Jamaica* and *Cape Bona Esperance*.

Jamaica, in Latitude— — — —	17 40 N.
Cape Bona Esperance, in Latitude — — — —	34 07 S.
The Difference of Latitude — — — —	51 47

which Degrees being multiplied by 60, and the odd 47 Min. 60  
taken in, will give the Difference of Lat. in 31 07 Miles.

## Rules for Latitude.

The Latitude sail'd from, and the Difference of Latitude being given, to find what Latitude the Ship is come into?

*Case the 1st.* When you sail from North Latitude to the Northward, or from South Latitude to the Southward, add the Difference of Latitude (it being first brought into Degrees, if need be, by dividing it by 60) to the Latitude sail'd from, the Sum will be the Latitude you are come into, of the same Name with the Latitude sail'd from.

*Example 1st.* A Ship from a Place in the Latitude 14 10 N. sails to the Northward till she makes her Difference of Latitude 04 21 : What Latitude is she come into?

Latitude sail'd from— — — —	14 10 N.
Difference of Latitude — — — —	04 21
Latitude come into — — — —	18 31 N.

*Example 2d.* A Ship from Latitude 29 17 S. sails to the Southward, till she makes her Difference of Latitude 374 Miles : What Latitude is she come into?

Latitude sail'd from — — — —	29 17 S.
Diff. of Lat. 374 Miles, divided by 60 makes— — — —	06 14
Latitude come into — — — —	35 31 S.

P

*Capt*



*Case the 2d.* When you sail from North Latitude to the Southward, or from South Latitude to the Northward, subtract the Difference of Latitude, if least, from the Latitude sail'd from, the Remainder is the Latitude come into, of the same Name with the Latitude you sail'd from.

But if the Difference of Latitude be biggest, then subtract the Latitude from the Difference of Latitude, the Remainder will be the Latitude come into, of a contrary Name to the Latitude you sail'd from.

*Example 1st.* A Ship from Latitude 49 14 N. sails to the Southward, till her Difference of Latitude be 521 Miles: What Latitude is she come into?

Latitude sail'd from	—	—	—	—	49 14 N.
Diff. of Lat. 521 Miles, divided by 60, makes—					08 41
Latitude come into					40 33 N.

*Example 2.* A Ship from Latitude 4 18 S. sails to the Northward, till her Difference of Latitude be 10 24: What Latitude is she come into?

Latitude sail'd from—	—	—	—	—	04 18 S.
Difference of Latitude —					10 24
Latitude come into—					06 06 N.

### *Rules for Longitude.*

The Longitudes of any two Places being given, to find the Difference of Longitude between them.

*Rule.* If the Longitudes are both East, or both West, subtract the Lesser from the Greater, the Remainder will be the Difference of Longitude.

But if one Longitude be East, and the other West, then add them together, and their Sum (if less than 180 Degrees) will be the Difference of Longitude; but if it be more than 180 Degrees, then subtract it from 360.00, and the Remainder will be the Difference of Longitude.

*Example 1st.* What is the Difference of Longitude, between Cape Finister and Antigua?

Cape

## Rules for Longitude.

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Cape Finister, in Longitude — 09 40 W.  
 Antigua, in Longitude — — — 61 45 W.  
 The Difference of Longitude — 52 05

*Example 2d.* What is the Difference of Longitude between Barcelona and the Rock of Lisbon?

Barcelona, in Longitude — — — 02 18 E.  
 Rock of Lisbon, in Longitude — 09 50 W.  
 The Difference of Longitude - — 12 08

*Example 3d.* What is the Difference of Longitude between the SE. Point of Japan, and the Island of St. Christophers.

SE. Point of Japan, in Longitude — 140 30 E.  
 St. Christopher's, in Longitude — 62 40 W.  
 Exceeds 180.00 — — — 203 10  
 Subtract it from — — — 360 00  
 Remains the Difference of Longitude — 156 50

The Longitude fail'd from, and the Difference of Longitude being given, to find what Longitude the Ship is come into?

*Case 1st.* When you sail from East Longitude to the Eastward, or from West Longitude to the Westward, add the Difference of Longitude to the Longitude fail'd from, the Sum (if less than 180 Degrees) is the Longitude come into, of the same Name with the Longitude you sail'd from.

But if the Sum should be more than 180 Degrees, then subtract it from 360.00, and the Remainder will be the Longitude you are come into, of a contrary Name to the Longitude you sail'd from.

*Example 1st.* A Ship from Longitude of 48 21 E. sails to the Eastward, till she makes her Difference of Longitude 287 Miles: What Longitude is she come into?

Longitude fail'd from — — — — 48 21 E.  
 Difference of Longitude 287 Miles, or — 04 47  
 Longitude come into — — — — 53 08 E.

*Example 2d.* A Ship from the Longitude of 178 47: West, sails to the Westward till her Difference of Longitude be 12 17: What Longitude is she come into?



## Rules for Longitude.

Longitude fail'd from	—————	178 47 W.
Difference of Longitude	—————	12 17
		<u>191 04</u>
Exceeds 180.00	————	
Subtract it from	————	<u>360 00</u>
Remains the Longitude come into	————	168 56 E.

*Case the 2d.* When you fail from East Longitude to the Westward, or from West Longitude to the Eastward, subtract the Difference of Longitude (if it be least) from the Longitude you fail'd from, and the Remainder will be the Longitude come into, of the same Name with the Longitude fail'd from.

But if the Difference of Longitude be the biggest, then subtract the Longitude, from the Difference of Longitude, and the Remainder will be the Longitude come into, of a contrary Name to the Longitude fail'd from.

*Example 1st.* A Ship from Longitude 98 17 East, fails to the Westward till she makes her Difference of Longitude 14 21: What Longitude is she come into?

Longitude fail'd from	—————	98 17 E.
Difference of Longitude	—————	14 21
Longitude come into	—————	<u>83 56 E.</u>

*Example 2d.* A Ship from Longitude 44 21 West, fails to the Eastward till her Difference of Longitude be 81 42: What Longitude is she come into?

Longitude fail'd from	—————	44 21 W.
Difference of Longitude	—————	81 42
Longitude come into	—————	<u>37 21 E.</u>

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Here follows a Table of Meridional Parts, to every Degree and Minute of Latitude.

M	od	1 d	2 d	3 d	4 d	5 d	6 d	7 d	8 d	9 d	10 d	11 d	12 d	13 d	M
0	0	60	120	180	240	300	361	421	482	542	603	664	725	787	0
1	1	61	121	181	241	301	362	422	483	543	604	665	726	788	1
2	2	62	122	182	242	302	363	423	484	544	605	666	727	789	2
3	3	63	123	183	243	303	364	424	485	545	606	667	728	790	3
4	4	64	124	184	244	304	365	425	486	546	607	668	729	791	4
5	5	65	125	185	245	305	366	426	487	547	608	669	730	792	5
6	6	66	126	186	246	306	367	427	488	548	609	670	731	793	6
7	7	67	127	187	247	307	368	428	489	549	610	671	732	794	7
8	8	68	128	188	248	308	369	429	490	550	611	672	733	795	8
9	9	69	129	189	249	309	370	430	491	551	612	673	735	796	9
10	10	70	130	190	250	310	371	431	492	552	613	674	736	797	10
11	11	71	131	191	251	311	372	432	493	553	614	675	737	798	11
12	12	72	132	192	252	312	373	433	494	554	615	676	738	799	12
13	13	73	133	193	253	313	374	434	495	555	616	677	739	800	13
14	14	74	134	194	254	314	375	435	496	556	617	678	740	801	14
15	15	75	135	195	255	315	376	436	497	557	618	679	741	802	15
16	16	76	136	196	256	316	377	437	498	558	619	680	742	803	16
17	17	77	137	197	257	317	378	438	499	559	620	681	743	804	17
18	18	78	138	198	258	318	379	439	500	560	621	682	744	805	18
19	19	79	139	199	259	319	380	440	501	561	622	683	745	806	19
20	20	80	140	200	260	320	381	441	502	562	623	684	746	807	20
21	21	81	141	201	261	321	382	442	503	563	624	685	747	808	21
22	22	82	142	202	262	322	383	443	504	564	625	686	748	809	22
23	23	83	143	203	263	323	384	444	505	565	626	687	749	810	23
24	24	84	144	204	264	324	385	445	506	566	627	688	750	811	24
25	25	85	145	205	265	325	386	446	507	567	628	689	751	812	25
26	26	86	146	206	266	326	387	447	508	568	629	690	752	813	26
27	27	87	147	207	267	327	388	448	509	569	630	691	753	814	27
28	28	88	148	208	268	328	389	449	510	570	631	692	754	815	28
29	29	89	149	209	269	329	390	450	511	571	632	693	755	816	29
30	30	90	150	210	270	330	391	451	512	572	633	694	756	817	30
31	31	91	151	211	271	331	392	452	513	573	634	695	757	818	31
32	32	92	152	212	272	332	393	453	514	574	635	696	758	819	32
33	33	93	153	213	273	333	394	454	515	575	636	697	759	820	33
34	34	94	154	214	274	334	395	455	516	576	637	698	760	821	34
35	35	95	155	215	275	335	396	456	517	577	638	699	761	822	35
36	36	96	156	216	276	336	397	457	518	578	639	700	762	823	36
37	37	97	157	217	277	337	398	458	519	579	640	701	763	824	37
38	38	98	158	218	278	338	399	459	520	580	641	702	764	825	38
39	39	99	159	219	279	340	400	460	521	581	642	703	765	826	39
40	40	100	160	220	280	341	401	461	522	582	643	704	766	827	40
41	41	101	161	221	281	342	402	462	523	583	644	705	767	828	41
42	42	102	162	222	282	343	403	463	524	584	645	706	768	829	42
43	43	103	163	223	283	344	404	464	525	585	646	707	769	830	43
44	44	104	164	224	284	345	405	465	526	586	647	708	770	831	44
45	45	105	165	225	285	346	406	466	527	587	648	709	771	832	45
46	46	106	166	226	286	347	407	467	528	588	649	710	772	833	46
47	47	107	167	227	287	348	408	468	529	589	650	711	773	834	47
48	48	108	168	228	288	349	409	469	530	590	651	712	774	835	48
49	49	109	169	229	289	350	410	470	531	591	652	713	775	836	49
50	50	110	170	230	290	351	411	471	532	592	653	714	776	837	50
51	51	111	171	231	291	352	412	472	533	593	654	715	777	838	51
52	52	112	172	232	292	353	413	473	534	594	655	716	778	839	52
53	53	113	173	233	293	354	414	474	535	595	656	717	779	840	53
54	54	114	174	234	294	355	415	475	536	596	657	718	780	841	54
55	55	115	175	235	295	356	416	476	537	597	658	719	781	842	55
56	56	116	176	236	296	357	417	477	538	598	659	720	782	843	56
57	57	117	177	237	297	358	418	478	539	599	660	721	783	844	57
58	58	118	178	238	298	359	419	479	540	600	661	722	784	845	58
59	59	119	179	239	299	360	420	480	541	601	662	723	785	846	59



M	14d	15d	16d	17d	18d	19d	20d	21d	22d	23d	24d	25d	26d	27d	M
0	848	910	973	1035	1098	1161	1225	1289	1354	1419	1484	1550	1616	1684	0
1	849	911	974	36	99	63	26	90	55	20	85	51	18	85	1
2	851	913	975	37	1100	64	27	91	56	21	86	52	19	86	2
3	852	914	976	38	01	65	28	92	57	22	87	53	20	87	3
4	853	915	977	39	02	66	29	93	58	23	88	54	21	88	4
5	854	916	978	41	03	67	30	95	59	24	90	56	22	89	5
6	855	917	979	42	05	68	32	96	60	25	91	57	23	90	6
7	856	918	980	43	06	69	33	97	61	26	92	58	24	91	7
8	857	919	981	44	07	70	34	98	62	27	93	59	25	93	8
9	858	920	982	45	08	71	35	99	63	28	94	60	26	94	9
10	859	921	983	1046	1109	1172	1236	1300	1364	1429	1495	1561	1628	1695	10
11	860	922	984	47	10	73	37	01	66	31	96	62	29	96	11
12	861	923	985	48	11	74	38	02	67	32	97	63	30	97	12
13	862	924	986	49	12	75	39	03	68	33	98	64	31	98	13
14	863	925	987	50	13	76	40	04	69	34	99	65	32	99	14
15	864	926	988	51	14	77	41	05	70	35	1500	67	33	1700	15
16	864	927	989	52	15	78	42	06	71	36	02	68	34	01	16
17	866	928	990	53	16	79	43	07	72	37	03	69	35	03	17
18	867	929	991	54	17	81	44	08	73	38	04	70	37	04	18
19	868	930	992	55	18	82	45	10	74	39	05	71	38	05	19
20	869	931	994	1056	1119	1183	1246	1311	1375	1440	1506	1572	1639	1706	20
21	870	932	995	5	20	84	48	12	76	41	07	73	40	07	21
22	871	933	996	58	21	85	49	13	77	43	08	74	41	08	22
23	872	934	997	59	22	86	50	14	79	44	09	75	42	09	23
24	873	935	998	60	23	87	51	15	80	45	10	77	43	10	24
25	874	936	999	61	25	88	52	16	81	46	11	78	44	12	25
26	875	937	1000	63	26	89	53	17	82	47	13	79	45	13	26
27	876	938	1001	64	27	90	54	18	83	48	14	80	47	14	27
28	877	939	1002	65	28	91	55	19	84	49	15	81	48	15	28
29	878	941	1003	66	29	92	56	20	85	50	16	82	49	16	29
30	879	942	1004	1067	1130	1193	1257	1321	1386	1451	1517	1583	1650	1717	30
31	880	943	05	68	31	94	58	22	87	52	18	84	51	18	31
32	881	944	06	69	32	95	59	24	88	53	19	85	52	20	32
33	883	945	07	70	33	96	60	25	89	55	20	86	53	21	33
34	884	946	08	71	34	97	61	26	90	56	21	88	54	22	34
35	885	947	09	72	35	99	62	27	92	57	22	89	56	23	35
36	886	948	10	73	36	1200	64	28	93	58	24	90	57	24	36
37	887	949	11	74	37	01	65	29	94	59	25	91	58	25	37
38	888	950	12	75	38	02	66	30	95	60	26	92	59	26	38
39	889	951	13	76	39	03	67	31	96	61	27	93	60	27	39
40	890	952	1014	1077	1140	1204	1268	1332	1397	1462	1528	1594	1661	1729	40
41	891	953	15	78	41	05	69	33	98	63	29	95	62	30	41
42	892	954	16	79	42	06	70	34	99	64	30	96	63	31	42
43	893	955	18	80	44	07	71	35	1400	65	31	98	64	32	43
44	894	956	19	81	45	08	72	36	01	67	32	99	66	33	44
45	895	957	20	82	46	09	73	38	02	68	33	1600	67	34	45
46	896	958	21	83	47	10	74	39	03	69	35	01	68	35	46
47	897	959	22	85	48	11	75	40	05	70	36	02	69	36	47
48	898	960	23	86	49	12	76	41	06	71	37	03	70	38	48
49	899	961	24	87	50	13	77	42	07	72	38	04	71	39	49
50	900	962	1025	1088	1151	1214	1278	1343	1408	1473	1539	1605	1672	1740	50
51	901	963	26	89	52	16	80	44	09	74	40	06	73	41	51
52	902	964	27	90	53	17	81	45	10	75	41	07	75	42	52
53	903	965	28	91	54	18	82	46	11	76	42	09	76	43	53
54	904	966	29	92	55	19	83	47	12	77	43	10	77	44	54
55	905	968	30	93	56	20	84	48	13	79	44	11	78	45	55
56	906	969	31	94	57	21	85	49	14	80	46	12	79	47	56
57	907	970	32	95	58	22	86	50	15	81	47	13	80	48	57
58	908	971	33	96	59	23	87	52	16	82	48	14	81	49	58
59	909	972	34	97	60	24	88	53	18	83	49	15	82	50	59

M	28 d	29 d	30 d	31 d	32 d	33 d	34 d	35 d	36 d	37 d	38 d	39 d	40 d	41 d	M
0	1751	1819	1888	1958	2028	2100	2171	2244	2318	2393	2468	2545	2623	2702	0
1	52	21	90	59	30	01	73	45	19	94	70	46	24	03	1
2	53	22	91	60	31	02	74	47	20	95	71	48	25	04	2
3	55	23	92	62	32	03	75	48	22	96	72	49	27	06	3
4	56	24	93	63	33	04	76	49	23	98	73	50	28	07	4
5	57	25	94	64	34	05	78	50	24	99	75	51	29	08	5
6	58	26	95	65	35	07	79	52	25	2400	76	53	31	10	6
7	59	27	96	66	37	08	80	53	27	01	77	54	32	11	7
8	60	29	98	67	38	09	81	54	28	03	78	55	33	12	8
9	61	30	99	69	39	10	82	55	29	04	80	57	34	14	9
10	1762	1831	1900	1970	2040	2111	2184	2256	2330	2405	2481	2558	2636	2715	10
11	64	32	01	71	41	13	85	58	32	05	82	59	37	16	11
12	65	33	02	72	43	14	86	59	33	08	84	60	38	18	12
13	66	34	03	73	44	15	87	60	34	09	85	62	40	19	13
14	67	35	05	74	45	16	88	61	35	10	86	63	41	20	14
15	68	37	06	76	46	17	90	63	37	11	87	64	42	22	15
16	69	38	07	77	47	19	91	64	38	13	89	66	44	23	16
17	70	39	08	78	48	20	92	65	39	14	90	67	45	24	17
18	72	40	09	79	50	21	93	66	40	15	91	68	46	26	18
19	73	41	10	80	51	22	94	68	42	16	92	69	48	27	19
20	1774	1842	1911	1981	2052	2123	2196	2269	2343	2418	2494	2571	2649	2728	20
21	75	43	13	83	53	25	97	70	44	19	95	72	50	29	21
22	76	45	14	84	54	26	98	71	45	20	96	73	51	31	22
23	77	46	15	85	56	27	99	72	46	21	98	75	53	32	23
24	78	47	16	86	57	28	2200	74	48	23	99	76	54	33	24
25	80	48	17	87	58	29	02	75	49	24	2500	77	55	35	25
26	81	49	18	88	59	31	03	76	50	25	01	78	57	36	26
27	82	50	20	90	60	32	04	77	51	27	03	80	58	37	27
28	83	52	21	91	61	33	05	79	53	28	04	81	59	39	28
29	84	53	22	92	63	34	07	80	54	29	05	82	61	40	29
30	1785	1854	1923	1993	2064	2135	2208	2281	2355	2430	2506	2584	2662	2742	30
31	86	55	24	94	65	37	09	82	56	32	08	85	63	43	31
32	87	56	25	95	66	38	10	83	58	33	09	86	65	44	32
33	89	57	27	97	67	39	11	85	59	34	10	88	66	46	33
34	90	58	28	98	69	40	13	86	60	35	11	89	67	47	34
35	91	60	29	99	70	41	14	87	61	37	13	91	69	48	35
36	92	61	30	2000	71	43	15	88	63	38	14	91	70	50	36
37	93	62	31	01	72	44	16	90	64	39	15	93	71	51	37
38	94	63	32	02	73	45	17	91	65	40	16	94	73	52	38
39	95	64	34	04	75	46	19	92	66	42	18	95	74	54	39
40	1797	1865	1935	2005	2076	2147	2220	2293	2368	2443	2519	2597	2675	2755	40
41	96	66	36	06	77	49	21	95	69	44	21	98	76	56	41
42	98	68	37	07	78	50	22	96	70	45	22	99	78	58	42
43	1800	69	38	08	79	51	24	97	71	47	23	2601	79	59	43
44	01	70	39	10	80	52	25	98	73	48	24	02	80	60	44
45	02	71	41	11	82	53	26	99	74	49	26	03	81	62	45
46	03	72	42	12	83	55	27	2301	75	51	27	04	83	63	46
47	05	73	43	13	84	56	28	02	76	52	28	06	84	64	47
48	06	75	44	14	85	57	30	03	78	53	30	07	86	66	48
49	07	76	45	15	86	58	31	04	79	54	31	08	88	67	49
50	1808	1877	1946	2017	2088	2159	2232	2306	2380	2456	2532	2610	2688	2768	50
51	09	78	48	18	89	61	33	07	81	57	33	11	90	70	51
52	10	79	49	19	90	62	35	08	83	58	35	12	91	71	52
53	11	80	50	20	91	63	36	09	84	59	36	14	92	72	53
54	13	81	51	21	92	64	37	11	55	61	37	15	94	74	54
55	14	83	52	22	94	65	38	12	56	62	38	16	95	75	55
56	15	84	53	24	95	67	39	13	58	63	40	17	96	76	56
57	16	85	55	25	96	68	41	14	89	64	41	19	98	78	57
58	17	86	56	26	97	69	42	16	90	66	42	20	99	79	58
59	18	87	57	27	98	70	43	17	91	67	44	21	2700	80	59



M	42 d	43 d	44 d	45 d	46 d	47 d	48 d	49 d	50 d	51 d	52 d	53 d	54 d	55 d	M
0	2782	2863	2946	3030	3116	3203	3292	3382	3474	3569	3665	3764	3865	3968	0
1	83	64	47	31	17	04	93	84	76	70	67	65	66	70	1
2	84	66	49	33	18	06	95	85	78	72	68	67	68	71	2
3	86	67	50	34	20	07	96	87	79	74	70	69	70	73	3
4	87	69	51	36	21	09	98	88	81	75	72	70	71	75	4
5	88	70	53	37	23	10	99	90	82	77	73	72	73	77	5
6	90	71	54	38	24	12	3301	91	84	78	75	74	75	78	6
7	91	73	56	40	26	13	02	93	85	80	77	75	77	80	7
8	92	74	57	41	27	14	03	94	87	82	78	77	78	82	8
9	94	75	58	43	29	16	05	96	88	83	80	79	80	84	9
10	2795	2877	2960	3044	3130	3217	3306	3397	3490	3585	3681	3780	3882	3985	10
11	97	78	61	46	31	19	08	99	92	86	83	82	83	87	11
12	98	80	63	47	33	20	09	3400	93	88	85	84	85	89	12
13	99	81	64	48	34	22	11	02	95	90	86	85	87	91	13
14	2801	82	65	50	36	23	12	03	96	91	88	87	89	92	14
15	02	84	67	51	37	25	14	05	98	93	90	89	90	94	15
16	03	85	68	53	39	26	16	07	99	94	91	90	92	96	16
17	05	86	70	54	40	28	17	08	3501	96	93	92	94	98	17
18	06	88	71	55	42	29	19	10	03	98	95	94	95	99	18
19	07	89	72	57	43	31	20	11	04	99	96	95	97	1001	19
20	2809	2891	2974	3058	3144	3232	3322	3413	3506	3601	3698	3797	3899	3903	20
21	10	92	75	60	46	34	23	14	07	02	99	99	3901	05	21
22	11	93	76	61	47	35	25	16	09	04	3701	3800	02	06	22
23	13	95	78	63	49	37	26	17	10	06	03	02	04	08	23
24	14	96	79	64	50	38	28	19	12	07	04	04	06	10	24
25	15	97	81	65	52	40	29	20	14	09	06	06	07	12	25
26	17	99	82	67	53	41	31	22	15	10	08	07	09	14	26
27	18	2900	83	68	55	42	32	23	17	12	09	09	11	15	27
28	20	02	85	70	56	44	34	25	18	14	11	11	13	17	28
29	21	03	86	71	57	45	35	27	20	15	13	12	14	19	29
30	2822	2904	2988	3073	3159	3247	3337	3428	3521	3617	3714	3814	3916	4021	30
31	24	06	89	74	60	48	38	30	23	18	16	16	18	22	31
32	25	07	91	75	62	50	40	31	25	20	17	17	19	24	32
33	26	08	92	77	63	51	41	33	26	22	19	19	21	26	33
34	28	10	93	78	65	53	43	34	28	23	21	21	23	28	34
35	29	11	95	80	66	54	44	36	29	25	22	22	25	29	35
36	30	13	96	81	68	56	46	37	31	26	24	24	26	31	36
37	32	14	98	83	69	57	47	39	32	28	26	26	28	33	37
38	33	15	99	84	71	59	49	40	34	30	27	27	30	35	38
39	34	17	3000	85	72	60	50	42	36	31	29	29	32	37	39
40	2836	4918	3002	3087	3173	3262	3352	3443	3537	3633	3731	3831	3933	4038	40
41	37	19	03	88	75	63	53	45	39	34	32	32	35	40	41
42	39	21	05	90	76	65	55	47	40	36	34	34	37	42	42
43	40	22	06	91	78	66	56	48	42	38	36	36	38	44	43
44	41	24	07	93	79	68	58	50	43	39	37	38	40	45	44
45	43	25	09	94	81	69	59	51	45	41	39	39	42	47	45
46	44	26	10	95	82	71	61	53	47	43	41	41	44	49	46
47	45	28	12	97	84	72	62	54	48	44	42	43	45	51	47
48	47	29	13	98	85	74	64	56	50	46	44	44	47	52	48
49	48	31	14	3100	87	75	65	57	51	47	46	46	49	54	49
50	2849	2932	3016	3101	3188	3277	3367	3459	3553	3649	3747	3848	3951	4056	50
51	51	33	17	03	90	78	68	60	55	51	49	49	52	58	51
52	52	35	19	04	91	80	70	62	56	52	50	51	54	60	52
53	54	36	20	05	92	81	71	64	58	54	52	53	56	61	53
54	55	37	21	07	94	83	73	65	59	55	54	54	58	63	54
55	56	39	23	08	95	84	74	67	60	57	55	56	59	65	55
56	58	40	24	10	97	86	76	68	62	59	57	58	61	67	56
57	59	42	26	11	98	87	78	70	64	60	59	60	63	69	57
58	60	43	27	13	3200	89	79	71	65	62	60	61	64	70	58
59	62	44	28	14	01	90	81	73	67	64	62	63	66	72	59

M	56 d	57 d	58 d	59 d	60 d	61 d	62 d	63 d	64 d	65 d	66 d	67 d	68 c	69 d	M
0	4074	4183	4294	4409	4527	4649	4775	4905	5039	5179	5324	5474	5631	5795	0
1	76	84	96	11	29	51	77	07	42	81	26	77	33	97	1
2	77	86	98	13	31	53	79	09	44	84	28	79	36	5800	2
3	79	88	4300	15	33	55	81	12	46	86	31	82	39	03	3
4	81	90	02	17	35	57	84	14	49	88	33	84	42	05	4
5	83	92	04	19	37	60	86	16	51	91	36	87	44	09	5
6	85	94	06	21	39	62	88	18	53	93	38	89	47	11	6
7	86	95	08	23	41	64	90	20	55	95	41	92	50	14	7
8	88	97	09	25	43	66	92	23	58	98	43	95	52	17	8
9	90	99	11	27	45	68	94	25	60	5200	46	97	55	20	9
10	4092	4201	4313	4429	4547	4670	4796	4927	5062	5203	5348	5500	5658	5823	10
11	94	03	15	31	49	72	98	29	65	05	51	02	60	25	11
12	95	05	17	33	51	74	4801	31	67	07	53	05	63	28	12
13	97	07	19	34	53	76	03	34	69	10	56	07	66	31	13
14	99	08	21	36	55	78	05	36	71	12	58	10	68	34	14
15	4101	10	23	38	57	80	07	38	74	14	61	13	71	37	15
16	03	12	25	40	59	82	09	40	76	17	63	15	74	39	16
17	04	14	27	42	62	84	11	43	78	19	66	18	76	42	17
18	06	16	28	44	64	87	14	45	81	22	68	20	79	45	18
19	08	18	30	46	66	89	16	47	83	24	71	23	82	48	19
20	4110	4220	4332	4448	4568	4691	4818	4949	5085	5226	5373	5526	5685	5851	20
21	12	21	34	50	70	93	20	51	88	29	76	28	87	54	21
22	13	23	36	52	72	95	22	54	90	31	78	31	90	56	22
23	15	25	38	54	74	97	24	56	92	34	80	33	93	59	23
24	17	27	40	56	76	99	26	58	95	36	83	36	95	62	24
25	19	29	42	58	78	4701	29	60	97	38	85	39	98	65	25
26	21	31	44	60	80	03	31	63	99	41	88	41	5701	68	26
27	22	32	46	62	82	05	33	65	5102	43	90	44	04	71	27
28	24	34	47	64	84	07	35	67	04	46	93	46	06	74	28
29	26	36	49	66	86	10	37	69	06	48	95	49	09	76	29
30	4128	4238	4351	4468	4588	4712	4839	4972	5108	5250	5398	5552	5712	5879	30
31	30	40	53	70	90	14	42	74	11	53	5401	54	15	82	31
32	32	42	55	72	92	16	44	76	13	55	03	57	17	85	32
33	33	44	57	74	94	18	46	78	15	58	06	59	20	88	33
34	35	46	59	76	96	20	48	81	18	60	08	62	23	91	34
35	37	47	61	78	98	22	50	83	20	63	11	65	25	94	35
36	39	49	63	80	4600	24	52	85	22	65	13	67	28	96	36
37	41	51	65	82	02	26	55	87	25	67	16	70	31	99	37
38	42	53	67	84	04	28	57	90	27	70	18	73	34	5902	38
39	44	55	69	86	06	31	59	92	29	72	21	75	36	05	39
40	4146	4257	4370	4488	4608	4733	4861	4994	5132	5275	5423	5578	5739	5908	40
41	48	59	72	90	10	35	63	96	34	77	26	80	42	11	41
42	50	60	74	92	12	37	65	99	36	80	28	83	45	14	42
43	52	62	76	94	14	39	68	5001	39	82	31	86	47	17	43
44	53	64	78	95	16	41	70	03	41	84	33	88	50	19	44
45	55	66	80	97	18	43	72	05	43	87	36	91	53	22	45
46	57	68	82	99	20	45	74	08	46	89	38	94	56	25	46
47	59	70	84	4501	23	47	76	10	48	92	41	96	58	28	47
48	61	72	86	03	25	50	79	12	51	94	43	99	61	31	48
49	62	74	88	05	27	52	81	14	53	97	46	5602	64	34	49
50	4164	4275	4390	4507	4629	4754	4883	5017	5155	5299	5448	5604	5767	5937	50
51	66	77	92	09	31	56	85	19	58	5301	51	07	70	40	51
52	68	79	94	11	33	58	87	21	60	04	54	10	72	43	52
53	70	81	96	13	35	60	90	23	62	06	56	12	75	46	53
54	72	83	98	15	37	62	92	26	65	09	59	15	78	48	54
55	73	85	99	17	39	64	94	28	67	11	61	17	81	51	55
56	75	87	4401	19	41	66	96	30	69	14	64	20	83	54	56
57	77	89	03	21	43	69	98	33	72	16	66	23	84	57	57
58	79	91	05	23	45	71	4901	35	74	19	69	25	89	60	58
59	81	92	07	25	47	73	03	37	76	21	71	28	92	63	59



M	70 d	71 d	72 d	73 d	74 d	75 d	76 d	77 d	78 d	79 d	80 d	81 d	82 d	83 d	M
0	5966	6146	6335	6534	6746	6970	7210	7467	7745	8046	8375	8739	9145	9606	0
1	69	49	38	38	49	74	14	72	49	51	81	45	53	14	1
2	72	52	41	41	53	78	18	76	54	56	87	52	60	22	2
3	75	55	45	45	57	82	22	81	59	61	93	58	67	31	3
4	78	58	48	49	60	86	27	85	64	67	98	65	74	39	4
5	81	61	51	52	64	90	31	90	69	72	8404	71	82	47	5
6	84	64	54	50	62	94	35	94	74	77	10	78	89	55	6
7	86	67	58	58	71	97	39	98	78	83	16	84	96	64	7
8	89	70	61	62	75	7001	43	7503	83	88	22	91	9203	72	8
9	92	73	64	65	79	05	47	07	88	93	27	97	11	80	9
10	5995	6177	6367	6569	6782	7009	7252	7512	7793	8099	8433	8804	9218	9689	10
11	98	80	71	72	86	13	56	16	98	8104	39	10	25	97	11
12	6001	83	74	76	90	17	60	21	7803	09	45	17	33	9706	12
13	04	86	77	75	93	21	64	25	08	15	51	23	40	14	13
14	07	89	80	83	97	25	68	30	13	20	57	30	48	23	14
15	10	92	84	86	5801	29	73	35	17	25	63	36	55	31	15
16	13	95	87	90	04	33	77	39	22	31	69	43	62	40	16
17	16	98	90	93	08	37	81	44	27	36	74	49	70	48	17
18	19	6201	94	97	12	41	85	48	32	41	80	56	77	57	18
19	22	05	97	6600	15	45	89	53	37	47	86	63	85	65	19
20	5025	6208	6400	6600	6819	7048	7294	7557	7842	8152	8492	8869	9292	9774	20
21	28	11	03	07	23	52	98	62	47	58	98	76	9300	83	21
22	31	14	07	10	26	56	7302	66	52	63	8504	83	07	91	22
23	34	17	10	14	30	60	06	71	57	68	10	89	15	9800	23
24	37	20	13	17	34	64	11	76	62	74	16	96	22	09	24
25	40	23	16	21	38	68	15	80	67	79	22	8903	30	17	25
26	43	26	20	24	41	72	19	85	72	85	28	09	37	26	26
27	46	30	23	28	45	76	23	89	77	90	34	16	45	35	27
28	49	33	27	31	49	80	28	94	82	96	40	23	53	44	28
29	52	36	30	35	53	84	32	99	87	8201	46	30	60	52	29
30	5055	6239	6433	6639	6856	7088	7336	7603	7892	8207	8552	8936	9368	9861	30
31	58	42	37	42	60	92	41	08	97	12	58	43	76	70	31
32	61	45	40	46	64	96	45	12	7902	18	65	50	83	79	32
33	64	49	43	49	68	7100	49	17	07	23	71	57	91	88	33
34	67	52	47	53	71	04	53	22	12	29	77	63	99	97	34
35	70	55	50	56	75	08	58	26	17	34	83	70	9407	9906	35
36	73	58	53	60	79	12	62	31	22	40	89	77	14	15	36
37	76	61	57	63	83	16	66	36	27	45	95	84	22	24	37
38	79	64	60	67	86	20	71	40	32	51	8601	91	30	33	38
39	82	68	63	70	90	24	75	45	37	56	07	98	38	42	39
40	5085	6271	6467	6674	6894	7128	7379	7650	7942	8262	8614	9005	9445	9951	40
41	88	74	70	77	98	32	84	54	48	67	20	12	53	60	41
42	91	77	73	81	6901	36	88	59	53	73	26	18	61	69	42
43	94	80	77	85	05	40	92	64	58	79	32	25	69	78	43
44	97	83	80	88	09	45	97	68	63	84	38	32	77	87	44
45	6100	87	83	92	13	49	7401	73	68	90	44	39	85	9996	45
46	03	90	87	95	17	53	06	78	73	95	51	46	93	10005	46
47	06	93	90	99	20	57	10	83	78	8301	57	53	9501	10015	47
48	09	96	94	6702	24	61	14	87	83	07	63	60	09	10024	48
49	12	99	97	06	28	65	19	92	89	12	69	67	17	10033	49
50	5115	6303	6500	6710	6932	7169	7423	7697	7994	8318	8676	9074	9525	10043	50
51	18	06	04	13	36	73	27	7702	99	24	82	81	33	10052	51
52	21	09	07	17	40	77	32	06	8004	29	88	88	41	10061	52
53	24	12	11	20	43	81	36	11	09	35	95	96	49	10071	53
54	27	15	14	24	47	85	41	16	14	41	8701	9103	57	10080	54
55	30	19	17	28	51	89	45	21	20	47	07	10	65	10089	55
56	33	22	21	31	55	94	49	25	25	52	14	17	73	10099	56
57	36	25	24	35	59	98	54	30	30	58	20	24	81	10108	57
58	40	28	28	38	63	7202	58	35	35	64	26	31	85	10118	58
59	43	32	31	42	66	06	63	40	40	69	33	38	98	10127	59

M	84 d	85 d	86 d	87 d	88 d	89 d	M
0	10137	10765	11533	12522	13916	16300	0
1	147	776	547	541	945	357	1
2	157	788	561	561	974	416	2
3	166	799	576	580	14003	476	3
4	175	811	590	599	033	537	4
5	185	822	605	619	063	599	5
6	195	834	620	639	073	662	6
7	205	846	634	659	123	726	7
8	214	858	649	679	154	792	8
9	224	869	664	699	184	858	9
10	10234	10881	11679	12719	14216	16926	10
11	244	893	694	739	247	956	11
12	254	905	709	759	279	17067	12
13	264	917	724	780	311	139	13
14	273	929	739	801	343	213	14
15	283	941	755	821	376	289	15
16	293	953	770	842	408	366	16
17	303	965	785	863	442	445	17
18	314	978	801	884	475	526	18
19	324	990	816	906	509	609	19
20	10334	11002	11832	12927	14543	17693	20
21	344	014	848	949	578	781	21
22	354	027	863	970	613	870	22
23	364	039	879	992	648	962	23
24	374	052	895	13014	684	18056	24
25	385	064	911	036	720	153	25
26	395	077	927	059	756	252	26
27	405	089	943	081	793	355	27
28	416	102	959	104	830	461	28
29	426	115	976	126	868	570	29
30	10437	11127	11992	13149	14906	18682	30
31	447	140	12008	172	943	799	31
32	457	153	025	195	983	920	32
33	468	166	041	219	15022	19045	33
34	478	179	058	242	062	174	34
35	489	192	075	266	102	309	35
36	500	205	092	290	143	450	36
37	510	218	109	314	184	596	37
38	521	231	126	338	226	749	38
39	532	244	143	362	268	909	39
40	10542	11257	12100	13386	15311	20076	40
41	553	270	177	411	354	253	41
42	564	284	194	437	398	459	42
43	575	297	212	461	442	635	43
44	586	310	229	486	487	843	44
45	597	324	247	511	532	21065	45
46	608	337	264	537	579	303	46
47	619	351	282	563	625	557	47
48	630	365	300	589	673	832	48
49	641	378	318	615	721	22132	49
50	10652	11392	12336	13641	15770	22459	50
51	663	406	354	668	819	22821	51
52	674	420	373	695	869	23216	52
53	685	434	391	721	920	23685	53
54	696	448	409	749	972	24215	54
55	708	462	428	776	16024	24842	55
56	719	476	447	804	078	25609	56
57	730	490	465	832	132	26598	57
58	742	504	484	860	187	27992	58
59	753	518	503	888	243	30375	59

### The Use of the Table of Meridional Parts.

**I**N this Table the first and last Column of every Page mark'd M, beginning at 0, and ending at 59, contain the Minutes answering to every Degree of Latitude, the other Columns mark'd 1d, 2d, &c. contain the Meridional Parts, answering to the Degree of Latitude they stand under.

So that if you would find the Meridional Parts answering to any Latitude, suppose for Example, the Latitude 51.32, look in the Column under 51d. and right against 32 (in the Column for Minutes) you will find 20, to which prefix 36, the two Figures in the same Column that stand above 20 towards the Left-Hand, and it makes 3620, the Meridional Parts required.

*Two Latitudes being given, to find the Meridional Difference of Latitude.*

*Case 1st,* If both Latitudes be North or both South, subtract the Meridional Parts of the Lesser, from the Meridional Parts of the Greater, the Remainder will be the Meridional Difference of Latitude.

*Case 2d,* If one Latitude be North and the other South, then add their Meridional Parts together, and the Sum will be the Meridional Difference of Latitude. Q 2 A



A TABLE of Amplitudes, from the Latitude  
00 deg. 00 min. to the Latitude 12 deg. either  
North or South.

Degrees of Declination.	The Degrees of Latitude.											
	1	2	3	4	5	6	7	8	9	10	11	12
	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M
0	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00
1	01 00	01 00	01 00	01 00	01 00	01 00	01 00	01 00	01 00	01 01	01 01	01 01
2	02 00	02 00	02 00	02 00	02 00	02 00	02 01	02 01	02 01	02 02	02 02	02 03
3	03 00	03 00	03 00	03 00	03 00	03 01	03 01	03 01	03 02	03 03	03 03	03 04
4	04 00	04 00	04 00	04 00	04 01	04 01	04 02	04 02	04 03	04 04	04 04	04 05
5	05 00	05 00	05 00	05 01	05 01	05 01	05 02	05 03	05 03	05 05	05 05	05 07
6	06 00	06 00	06 00	06 01	06 01	06 02	06 02	06 03	06 04	06 06	06 07	06 08
7	07 00	07 00	07 01	07 01	07 02	07 02	07 03	07 04	07 05	07 07	07 07	07 09
8	08 00	08 00	08 01	08 01	08 02	08 02	08 03	08 04	08 06	08 08	08 09	08 11
9	09 00	09 00	09 01	09 01	09 02	09 03	09 04	09 05	09 07	09 09	09 10	09 12
10	10 00	10 00	10 01	10 01	10 02	10 03	10 04	10 05	10 07	10 10	10 11	10 13
11	11 00	11 00	11 01	11 01	11 03	11 03	11 05	11 06	11 08	11 11	11 12	11 15
12	12 00	12 00	12 01	12 01	12 03	12 04	12 05	12 07	12 09	12 12	12 13	12 16
13	13 00	13 00	13 01	13 02	13 03	13 04	13 06	13 08	13 10	13 13	13 15	13 18
14	14 00	14 00	14 01	14 02	14 03	14 04	14 06	14 08	14 10	14 14	14 16	14 19
15	15 00	15 00	15 01	15 02	15 04	15 05	15 07	15 09	15 11	15 15	15 17	15 21
16	16 00	16 01	16 01	16 02	16 04	16 05	16 07	16 09	16 12	16 16	16 18	16 22
17	17 00	17 01	17 01	17 02	17 04	17 05	17 08	17 10	17 13	17 17	17 20	17 23
18	18 00	18 01	18 01	18 02	18 04	18 06	18 08	18 11	18 14	18 18	18 21	18 25
19	19 00	19 01	19 01	19 03	19 04	19 06	19 09	19 11	19 15	19 19	19 22	19 26
20	20 00	20 01	20 02	20 03	20 05	20 07	20 09	20 12	20 16	20 20	20 24	20 28
21	21 00	21 01	21 02	21 03	21 05	21 07	21 10	21 13	21 17	21 21	21 25	21 29
22	22 00	22 01	22 02	22 03	22 05	22 07	22 10	22 13	22 17	22 22	22 26	22 31
23	23 00	23 01	23 02	23 03	23 05	23 08	23 11	23 14	23 18	23 23	23 28	23 33
23, 29	23 29	23 30	23 31	23 33	23 35	23 38	23 40	23 44	23 49	23 54	23 57	24 02

A T A B L E of Amplitudes, from the Latitude  
13 deg. 00 min. to the Latitude 24 deg. either  
North or South.

Degrees of Declination.	The Degrees of Latitude.											
	13	14	15	16	17	18	19	20	21	22	23	24
	D. M	D. M	D. M	D. M	D. M	D. M	D. M	D. M	D. M	D. M	D. M	D. M
0	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00
1	01 02	01 02	01 02	01 02	01 02	01 03	01 03	01 04	01 04	01 04	01 05	01 05
2	02 03	02 03	02 04	02 05	02 05	02 06	02 07	02 08	02 08	02 09	02 10	02 11
3	03 05	03 05	03 06	03 07	03 08	03 09	03 10	03 12	03 13	03 14	03 15	03 17
4	04 06	04 07	04 08	04 10	04 11	04 12	04 13	04 15	04 17	04 19	04 21	04 23
5	05 08	05 09	05 11	05 12	05 13	05 15	05 17	05 19	05 21	05 23	05 26	05 28
6	06 10	06 11	06 13	06 15	06 16	06 19	06 21	06 23	06 26	06 28	06 31	06 34
7	07 11	07 13	07 15	07 17	07 19	07 22	07 24	07 27	07 30	07 33	07 36	07 40
8	08 12	08 15	08 17	08 19	08 22	08 25	08 28	08 31	08 34	08 38	08 42	08 45
9	09 14	09 17	09 19	09 22	09 25	09 28	09 31	09 35	09 39	09 43	09 47	09 51
10	10 15	10 18	10 21	10 24	10 27	10 30	10 34	10 38	10 43	10 47	10 52	10 57
11	11 17	11 20	11 23	11 27	11 30	11 34	11 38	11 43	11 48	11 52	11 58	12 03
12	12 19	12 22	12 25	12 29	12 33	12 38	12 42	12 47	12 52	12 57	13 03	13 10
13	13 21	13 24	13 28	13 32	13 36	13 41	13 47	13 52	13 58	14 04	14 10	14 17
14	14 22	14 26	14 30	14 34	14 39	14 44	14 50	14 55	15 01	15 07	15 14	15 21
15	15 24	15 28	15 32	15 37	15 42	15 47	15 53	16 00	16 05	16 12	16 19	16 27
16	16 26	16 30	16 35	16 40	16 45	16 51	16 57	17 03	17 10	17 18	17 25	17 34
17	17 28	17 32	17 37	17 42	17 48	17 54	18 01	18 07	18 15	18 23	18 31	18 40
18	18 30	18 34	18 40	18 45	18 51	18 57	19 05	19 11	19 20	19 28	19 37	19 46
19	19 31	19 36	19 42	19 48	19 54	20 01	20 08	20 16	20 24	20 33	20 43	20 52
20	20 33	20 38	20 44	20 51	20 57	21 05	21 12	21 20	21 29	21 39	21 49	21 59
21	21 35	21 41	21 46	21 53	22 00	22 08	22 16	22 25	22 34	22 44	22 55	23 06
22	22 37	22 43	22 49	22 56	23 04	23 12	23 20	23 29	23 39	23 50	24 01	24 12
23	23 38	23 45	23 51	23 59	24 07	24 15	24 24	24 34	24 44	24 55	25 07	25 19
23, 29	24 08	24 15	24 22	24 29	24 38	24 46	24 56	25 05	25 16	25 27	25 39	25 51



A TABLE of Amplitudes, from the Latitude  
25 deg. 00 min. to the Latitude 36 deg. either  
North or South.

Degrees of Declination.	The Degrees of Latitude.											
	25	26	27	28	29	30	31	32	33	34	35	36
	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M
0	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00
1	01 06	01 07	01 07	01 08	01 08	01 09	01 10	01 10	01 11	01 12	01 13	01 14
2	02 12	02 13	02 14	02 16	02 17	02 18	02 20	02 21	02 23	02 25	02 27	02 28
3	03 18	03 20	03 22	03 24	03 25	03 28	03 30	03 33	03 35	03 37	03 40	03 43
4	04 25	04 27	04 29	04 32	04 34	04 37	04 40	04 43	04 46	04 50	04 53	04 57
5	05 31	05 33	05 36	05 40	05 43	05 46	05 50	05 54	05 58	06 02	06 06	06 11
6	06 37	06 41	06 44	06 48	06 52	06 56	07 00	07 04	07 09	07 15	07 20	07 25
7	07 43	07 48	07 51	07 56	08 00	08 05	08 10	08 16	08 21	08 27	08 33	08 39
8	08 50	08 54	08 59	09 04	09 09	09 15	09 21	09 27	09 33	09 39	09 47	09 54
9	09 56	10 01	10 06	10 12	10 18	10 24	10 31	10 37	10 45	10 52	11 00	11 09
10	11 02	11 07	11 14	11 20	11 26	11 33	11 41	11 48	11 56	12 04	12 13	12 23
11	12 09	12 15	12 22	12 29	12 36	12 43	12 52	13 00	13 09	13 18	13 28	13 38
12	13 16	13 23	13 29	13 37	13 45	13 53	14 02	14 11	14 21	14 31	14 42	14 53
13	14 23	14 31	14 38	14 46	14 54	15 03	15 13	15 23	15 33	15 44	15 56	16 09
14	15 29	15 37	15 45	15 54	16 03	16 13	16 23	16 34	16 45	16 57	17 11	17 24
15	16 35	16 44	16 53	17 03	17 12	17 23	17 34	17 46	17 58	18 11	18 25	18 39
16	17 42	17 51	18 01	18 11	18 22	18 33	18 45	18 58	19 11	19 25	19 39	19 55
17	18 49	18 59	19 09	19 20	19 31	19 43	19 56	20 10	20 24	20 39	20 54	21 11
18	19 56	20 06	20 17	20 29	20 41	20 54	21 08	21 22	21 37	21 53	22 10	22 27
19	21 03	21 14	21 26	21 38	21 51	22 05	22 19	22 34	22 50	23 07	23 25	23 43
20	22 10	22 22	22 34	22 48	23 01	23 16	23 31	23 47	24 04	24 21	24 40	25 00
21	23 18	23 30	23 43	23 57	24 11	24 27	24 43	25 00	25 18	25 36	25 56	26 18
22	24 24	24 38	24 51	25 06	25 22	25 38	25 55	26 13	26 32	26 51	27 13	27 35
23	25 32	25 46	26 00	26 16	26 32	26 49	27 07	27 26	27 46	28 07	28 29	28 53
23,29	26 05	26 19	26 34	26 49	27 06	27 23	27 42	28 01	28 22	28 44	29 06	29 30

A TABLE of Amplitudes, from the Latitude  
37 deg. 00 min. to the Latitude 48 deg. either  
North or South.

Degrees of Declination.	The Degrees of Latitude.											
	37	38	39	40	41	42	43	44	45	46	47	48
	D M D M D M D M D M D M D M D M D M D M D M											
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	15	01	16	01	17	01	18	01	19	01	20
2	02	30	02	32	02	34	02	36	02	39	02	41
3	03	45	03	48	03	51	03	53	03	58	04	02
4	05	00	05	05	05	08	05	13	05	18	05	23
5	06	15	06	21	06	26	06	32	06	38	06	44
6	07	31	07	37	07	43	07	50	07	57	08	03
7	08	46	08	54	09	01	09	09	09	17	09	26
8	10	02	10	11	10	19	10	28	10	37	10	47
9	11	17	11	27	11	37	11	47	11	57	12	09
10	12	32	12	43	12	54	13	05	13	18	13	31
11	13	49	14	01	14	14	14	25	14	39	14	53
12	15	05	15	18	15	31	15	45	16	00	16	15
13	16	21	16	35	16	49	17	05	17	20	17	37
14	17	38	17	53	18	08	18	24	18	42	19	00
15	18	54	19	10	19	27	19	44	20	04	20	23
16	20	11	20	28	20	46	21	05	21	25	21	46
17	21	28	21	46	22	06	22	26	22	47	23	10
18	22	46	23	05	23	26	23	47	24	10	24	34
19	24	05	24	24	24	46	25	09	25	33	25	58
20	25	21	25	43	26	06	26	31	26	56	27	24
21	26	39	27	03	27	27	27	53	28	21	28	50
22	27	58	28	23	28	49	29	16	29	45	30	16
23	29	17	29	43	29	11	30	40	31	11	31	43
24	29	56	30	22	30	50	31	20	31	52	32	28
25	30	15	31	01	31	09	32	03	32	23	33	03
26	31	34	32	20	32	28	33	22	33	42	34	20
27	32	53	33	39	33	47	34	31	34	51	35	38
28	33	12	34	58	34	06	35	40	35	59	36	57
29	34	31	35	17	35	25	36	58	36	17	37	16
30	35	50	36	36	36	44	37	36	37	35	38	35
31	36	09	37	55	37	03	38	54	38	13	39	53
32	37	28	38	14	38	22	39	12	39	31	40	11
33	38	47	39	33	39	41	40	30	40	50	41	29
34	39	06	40	52	40	59	41	49	41	58	42	47
35	40	25	41	11	41	18	42	08	42	27	43	26
36	41	44	42	30	42	37	43	27	43	46	44	45
37	42	03	43	49	43	56	44	46	44	05	45	04
38	43	22	44	08	44	15	45	05	45	24	46	23
39	44	41	45	27	45	34	46	24	46	43	47	42
40	45	00	46	46	46	53	47	43	47	02	48	01
41	46	19	47	05	47	12	48	02	48	21	49	20
42	47	38	48	24	48	31	49	21	49	40	50	39
43	48	57	49	43	49	50	50	40	50	59	59	58
44	49	16	50	02	50	09	51	49	51	18	59	57
45	50	35	51	21	51	28	52	08	52	37	59	56
46	51	54	52	40	52	47	53	27	53	56	59	55
47	52	13	53	59	53	16	54	46	54	15	59	54
48	53	32	54	18	54	35	55	05	55	34	59	53



A TABLE of Amplitudes, from the Latitude  
49 deg. 00 min. to the Latitude 60 deg. either  
North or South.

Degrees of Declination.	The Degrees of Latitude.											
	49	50	51	52	53	54	55	56	57	58	59	60
	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M	D M D M
0	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00
1	01 31	01 33	01 35	01 37	01 39	01 42	01 45	01 47	01 50	01 53	01 56	02 00
2	03 03	03 06	03 10	03 15	03 20	03 24	03 29	03 34	03 40	03 46	03 53	04 00
3	04 34	04 40	04 46	04 52	04 59	05 09	05 14	05 22	05 31	05 40	05 50	06 00
4	06 06	06 14	06 22	06 30	06 39	06 46	06 59	07 10	07 22	07 34	07 47	08 01
5	07 38	07 48	07 58	08 08	08 19	08 31	08 44	08 57	09 11	09 26	09 43	10 02
6	09 10	09 21	09 33	09 46	10 00	10 15	10 30	10 47	11 04	11 22	11 42	12 04
7	10 42	10 55	11 09	11 24	11 40	11 57	12 15	12 35	12 56	13 18	13 41	14 06
8	12 14	12 29	12 45	13 02	13 21	13 41	14 02	14 24	14 48	15 14	15 41	16 10
9	13 47	14 05	14 24	14 43	15 04	15 26	15 49	16 14	16 45	17 10	17 41	18 14
10	15 21	15 40	16 01	16 23	16 46	17 11	17 37	18 05	18 33	19 07	19 41	20 18
11	16 54	17 16	17 39	18 03	18 29	18 57	19 26	19 56	20 29	21 04	21 43	22 26
12	18 28	18 52	19 18	19 44	20 12	20 43	21 15	21 49	22 25	23 04	23 47	24 34
13	20 03	20 29	20 57	21 26	21 57	22 30	23 05	23 43	24 23	25 07	25 54	26 44
14	21 38	22 06	22 37	23 08	23 42	24 18	24 56	25 37	26 21	27 09	28 01	28 55
15	23 14	23 45	24 18	24 52	25 28	26 07	26 49	27 34	28 22	29 14	30 12	31 09
16	24 51	25 24	25 59	26 36	27 16	27 58	28 43	29 32	30 24	31 21	32 22	33 27
17	26 28	27 03	27 41	28 21	29 04	29 50	30 39	31 31	32 27	33 28	34 32	35 47
18	28 06	28 43	29 24	30 07	30 53	31 42	32 35	33 33	34 34	35 40	36 53	38 09
19	29 45	30 25	31 08	31 55	32 45	33 38	34 35	35 36	36 46	37 54	39 13	40 36
20	31 25	32 08	32 54	33 44	34 39	35 35	36 36	37 42	38 53	40 12	41 37	43 10
21	33 06	33 52	34 41	35 34	36 31	37 32	38 39	39 51	41 09	42 34	44 05	45 48
22	34 48	35 37	36 30	37 27	38 29	39 26	40 47	42 04	43 27	44 59	46 40	48 30
23	36 33	37 26	38 23	39 24	40 29	41 40	42 56	44 19	45 50	47 30	49 21	51 24
23, 29	37 26	38 20	39 19	40 23	41 29	42 46	44 00	45 27	47 02	48 46	50 47	52 51

A TABLE of Amplitudes from the Latitude 61 Deg. 00 min. to the Latitude 66 deg. either North or South.

Degrees of Declination.	The Degrees of Latitude.												The Use of the TABLES of Amplitudes.
	61		62		63		64		65		66		
	D	M	D	M	D	M	D	M	D	M	D	M	
0	00	00	00	00	00	00	00	00	00	00	00	00	The Amplitude of the Sun or any Star, is so many Degrees Distance as they Rise or Set, from the East or West Points of the Horizon, either North-erly or Southerly. <i>Note,</i> When the Sun or Stars have North Declination then the Amplitude found by these Tables must be reckoned from the East toward the North at their Rising; or from the West towards the North at their Setting.
1	02	03	02	07	02	12	02	17	02	22	02	27	
2	04	08	04	15	04	24	04	33	04	44	04	55	
3	06	12	06	24	06	37	07	51	06	06	07	23	
4	08	17	08	32	08	50	09	09	09	30	09	52	But if they have South Declination, then the Amplitude must be reckoned from the East toward the South at their Rising; or from the West toward the South at their Setting.
5	10	21	10	41	11	04	11	28	11	54	12	22	
6	12	27	12	52	13	19	13	47	14	19	14	53	
7	14	34	15	02	15	34	16	08	16	45	17	26	
8	16	40	17	14	17	51	18	30	19	13	20	00	<i>To find the true Amplitude by the Tables.</i> Look for the given Latitude, at the Top of the Table, and the Declination in the first Column to the Left-Hand, and in the Common-Angle of meeting, you will find the Amplitude required, in Degrees and Minutes.
9	18	49	19	28	20	09	20	54	21	43	22	37	
10	20	57	21	40	22	27	23	18	24	13	25	14	
11	23	10	23	58	24	51	25	48	26	50	27	58	
12	25	23	26	17	27	15	28	19	29	28	30	44	
13	27	39	28	37	29	42	30	52	32	09	33	34	
14	29	56	31	01	32	12	33	30	34	55	36	29	
15	32	16	33	27	34	45	36	11	37	46	39	31	
16	34	39	35	57	37	23	38	57	40	42	42	40	
17	37	05	38	31	40	05	41	49	43	46	45	58	
18	39	36	41	10	42	54	44	49	46	59	49	26	
19	42	11	43	54	45	49	47	57	50	23	53	11	
20	44	52	46	46	48	53	51	17	54	02	57	14	
21	47	40	49	46	52	07	54	50	57	59	61	47	
22	50	35	52	56	55	36	58	43	62	26	67	04	
23	53	42	56	20	59	24	63	02	67	36	73	52	
23, 29	55	17	58	04	61	22	65	22	70	33	78	25	



## Rules concerning Amplitudes.

*Case 1st.* **W**hen the Latitude and Declination are both given in even Degrees, as for *Example*. Suppose I would know the Sun's true Amplitude at his Rising, in the Latitude of 40 00, his Declination being 17 00 N.

Under Latitude 40, and right against Declination 17 I find 22 26, which is the Sun's true Amplitude, to be counted from the East towards the North (because it is at his Rising, and the Declination is North) that is E. 22 26 N.

*Case 2d.* When the Latitude is given in even Degrees, and the Declination in Degrees and Minutes, as for *Example*. Suppose I would know the Sun's true Amplitude at his Setting, in the Latitude of 57 00, his Declination being 11 33 S.

Find his Amplitude as before, for the Latitude 57, and for

the Declination  $\left\{ \begin{array}{l} 11 \text{ deg.} \\ 12 \text{ deg.} \end{array} \right\}$  which will be  $\left\{ \begin{array}{l} 20 \ 29 \\ 22 \ 25 \end{array} \right\}$  then

Subtract the Lesser from the Greater, the Diff. is 1 56 or 116 m. to which put two Cyphers and it makes 11600, which Number must be divided by the Number standing against the odd Minutes of Declination (in the following Table) which in this *Case* is 181, and the Quotient gives the Proportional Parts in Minutes, which Parts are always to be added to the Lesser of the two Amplitudes that you took the Difference of, and the Sum gives the true Amplitude as follows,

$$\begin{array}{r} 181 \overline{) 11600} (64 \text{ Proportional Parts in Minutes,} \\ \underline{740} \phantom{00} \text{makes 1 Degree 4 Minutes.} \\ 10 \end{array}$$

Lesser of the Amplitudes	_____	20 29
Proportional Parts to be added	_____	01 04
True Amplitude	_____	W. 21 33 S.

because at Sun-setting, and the Declination South.

*Case 3d.* When the Declination is given in even Degrees and the Latitude in Degrees and Minutes, as for *Example*. Suppose I would know the Sun's true Amplitude at his Rising, in the Latitude 51 14 his Declination being 14 00 S.

Find his Amplitude as before, to 14 Degrees Declination, and for

the Latitude  $\left\{ \begin{array}{l} 51 \text{ deg.} \\ 52 \text{ deg.} \end{array} \right\}$  which will be  $\left\{ \begin{array}{l} 22 \ 37 \\ 23 \ 08 \end{array} \right\}$  and Subtract the Lesser from the greater, the Difference is 0 31 Minutes.

To

# Rules concerning Amplitudes.

123

To the Difference of Amplitudes found on the foregoing Side, which is 31, put two Cyphers, and makes it 3100, which must be divided by the Number standing against the odd Minutes of Latitude (in the following Table) which in this *Case* is 428, and the Quotient gives the Proportional Parts in Minutes, to be added to the Lesser of the two Amplitudes, as in *Case* the 2d.

428(3100(7 Proportional Parts in Minutes.

	104	
Lesser of the Amplitudes	_____	22 37
Proportional Parts to be added	_____	00 07
True Amplitude	_____	E. 22 44 S.

*Case 4th.* When the Latitude and Declination are both given in Degrees and Minutes, as for *Example*. Suppose I would know the Sun's true Amplitude at his setting, in the Latitude 49 18, his Declination being 19 41 N.

First, find his Amplitude for Latitude 49 Degrees, and Declination 19 41 (as in *Case the 2d*) which will be 30 53.

In the same manner find his Amplitude for Latitude 50 Degrees, and Declination 19 41, which will be 31 35.

Then from the Greater Amplitude	_____	31 35
Subtract the Lesser	_____	30 53
Remains the Difference	_____	00 42 Minutes.

Put two Cyphers to this Difference it makes 4200, which must be divided by the Numbers standing right against the odd Minutes of the given Latitude, (in the following Table) which in this *Case* is 333, the Quotient gives the Proportional Parts in Minutes, to be added to the Lesser of the two Amplitudes, &c.

333)4200(12 Proportional Parts.

870  
 204

The Lesser Amplitude	_____	30 53
Proportional Parts to be added	_____	00 12
True Amp. for Lat. 49 18, and Decl. 19 41 N.	_____	W. 31 05 N.
	R 2	A



A TABLE of Numbers, for finding the Proportional Parts, to the odd Minutes of Latitude or Declination, in finding the Sun's true Amplitude.

Minutes.	Odd	Num- bers.	Minutes.	Odd	Num- bers.	Minutes.	Odd	Num- bers.	Minutes.	Odd	Num- bers.
1		6000	16		375	31		193	46		130
2		3000	17		353	32		187	47		127
3		2000	18		333	33		181	48		125
4		1500	19		316	34		176	49		122
5		1200	20		300	35		171	50		120
6		1000	21		285	36		166	51		118
7		857	22		273	37		162	52		115
8		750	23		261	38		158	53		113
9		666	24		250	39		154	54		111
10		600	25		240	40		150	55		109
11		545	26		230	41		146	56		107
12		500	27		222	42		143	57		105
13		461	28		214	43		139	58		103
14		428	29		207	44		136	59		101
15		400	30		200	45		133			

The Use of this Table is to find a Number to divide the Difference of Amplitudes by, in order to find the Proportional Parts, when the Amplitude is required for any Latitude or Declination that is given in Degrees and Minutes, (as in the foregoing Cases) to find which Number, look in some of the Columns under the Title of odd Minutes, for your given Minutes of Latitude or Declination, as Suppose for 37 Minutes, and right against that you will find 162, which is the Number required.

To.

*To find the Variation of the Compass by an Amplitude.*

To do this, you must have given both the true and magnetical Amplitudes.

The true Amplitude is to be found by the Tables as before taught.

The magnetical Amplitude is to be found by the Compass, at the Time of the Sun's-rising or setting, and is so many Degrees and Minutes as you find it to rise from the East, or to set from the West, either to the Northward or to the Southward; as for *Ex.* Suppose being at Sea, I find by setting the Sun with my Compass, that he rises 10 deg. 15 min. to the Northward of the East, then the magnetical Amplitude is E. 10. 15 N. Or Suppose I find by the Compass, then he sets 14 deg. 12 min. to the Southward of the West, then the magnetical Amplitude is W. 14 12 S.

Then if your true Amplitude and magnetical Amplitude are both to the Northward, or both to the Southward, subtract the Lesser from the Greater, the Remainder is the Variation.

But if one be to the Northward, and the other to the Southward, add them together, and the Sum will be the Variation.

		d.	m.	
<i>Example 1st.</i>	True Amplitude	_____	E. 18 34	N.
	Magnetical Amplitude	_____	E. 22 37	N.
	Variation	_____	04 03	Easterly.

<i>Example 2d.</i>	True Amplitude	_____	W. 7 11	S.
	Magnetical Amplitude	_____	W. 2 06	N.
	Variation	_____	9 17	Westerly.

And thus having found how much the Variation is, it remains in the next Place to find which way it is, that is, whether it is Easterly or Westerly.

*Rule,* If the Amplitude be taken at Sun-rising, and the magnetical Amplitude be farther from the North than the true Amplitude is, then the Variation is Westerly, but if it be nearer to the North, it is Easterly.

If it be taken at Sun-setting, if the magnetical Amplitude be farther from the North than the true Amplitude is, then the Variation is Easterly, but if it be nearer to the North, it is Westerly, as may be seen by the two foregoing Examples.

By.



By keeping a Journal is meant, keeping such an Account of the Ship's Way, that at any Time you may be able to know what Latitude and Longitude the Ship is in.

When a Ship is bound from any one Place to another that lies so far from it, that she is obliged to go out of sight of the Land for any considerable Time, as suppose from *England* to *Barbadoes*, then at the Time she leaves the Land, she is said to take her Departure, and that part of the Land she then leaves, as suppose the *Start*, the *Lizard*, the *Land's-end*, &c. is said to be the Place they take their Departure from. And at the Time of taking such Departure, the Captain or Mate generally takes the Bearing and Distance of that Land (according to his Judgment) and sets it down on the Log-Board, or in the Log-Book against the Time it was taken, thus,

*Lizard*, N. by W. Distance 5 Leagues.  
Or, *Start*, N. N. E. Distance 6 Leagues, &c.

And in the same manner for any other Place, Bearing and Distance, as you will see in the first Days Log. of the following Journal.

The Log-Book being mark'd as follows, with Columns for Course, Distance, Northing or Southing, Easting or Westing, Latitude by Dead Reckoning, Latitude by Observation, Meridian Distance, Longitude made, and Longitude in, you are to take Notice,

That in the Column for Course, you are always to set down the Course you have made by your Reckoning for that 24 Hours (that is, from the Noon of the Day before, to the Noon of the Day you Work on) the Sea Account being always kept from Noon to Noon.

In the Column for Distance, you are to set down the Distance made by your Reckoning for that 24 Hours.

In the Column of Northing or Southing, you are to set down the Difference of Latitude made that 24 Hours, marking the Column with N. if the Difference of Latitude be Northerly, or with S. if it be Southerly.

In the Column of Easting or Westing, you are to set down the Departure made that 24 Hours, marking the Column with E. if the Departure be Easterly, or with W. if it be Westerly.

In the Column mark'd Lat. by D. R. you are to set down the Latitude you reckon your self in on that Day.

In

In the Column mark'd Lat. by Obs. you are to set down the Latitude you find yourself to be in by Observation, if you have one, if not, then let it stand open.

In the Column for Mer. Dist. you are to set down (in Degrees and Minutes) how much Departure you have made in all, from the Place you took your Departure from.

In the Column of Long. made, you are to set down (in Degrees and Minutes) how much Difference of Longitude you have made in all from the Place you took your Departure from.

In the Column of Long. in, you are to set down what Longitude you find yourself to be in on that Day by your Reckoning.

*Note,* The Account of Longitude made, being what is always kept in his Majesty's Navy. And the Account of Longitude in, being most generally kept on Board the Merchant Ships: I shall in this Treatise shew how to keep them both, and shall leave it to the Practitioner's choice which he will make use of, they both being equally true, and there being no occasion to keep more than one of them.

And now having (I think) given a sufficient Account of the things that are to be set down in the several Columns, I shall lay down these few necessary Rules following, and then proceed to shew how they are all to be found, or the Method of Working a Days Work at Sea.

*Rule 1<sup>st</sup>,* Variation, if there be any, (as most commonly there is,) must be allowed upon all Courses steered, and upon all Bearings, &c. that are taken by the Compass, that is, if it be Easterly Variation it must be allowed to the Right-hand: But if Westerly Variation, then to the Left-hand of the Course or Bearing: Supposing yourself placed in the Center of the Compass, and looking directly forward to the Point you are to allow the Variation from.

*Example.* Suppose I steer SW. and there is one Point Westerly Variation, then my true Course will be SW. by S. or suppose I set a Point of Land, and find it to bear by my Compass ESE. and I know there is half a Point Easterly Variation, then the true Bearing is SE. by E.  $\frac{1}{2}$  E.

*Rule 2<sup>d</sup>,* Lee-way (which I shall not here describe, because sufficiently known to every Seaman) must be allow'd to the Right-hand of the Course steer'd, when the Larboard Tacks are Aboard, and to the Left-hand when the Starboard Tacks are Aboard.

*Example*



*Example.* Suppose I steer NE. by E. with my Larboard Tacks Aboard, and make one Point Lee-way, then my Course made good is ENE.

*Rule 3d.* Lee-way and Variation, when they are both to be allow'd one way, that is, both to the Right-hand, or both to the Left, add them together, and allow their Sum the same way they were to be allow'd.

But if they are to be allow'd one to the Right-hand, and the other to the Left, subtract the Lesser from the Greater, and allow the Remainder the same way as the Greater of them was to be allow'd.

*Example.* Suppose I steer NNW. with my Starboard Tacks Aboard, and make one Point Lee-way, there being at the same Time half a Point Westerly Variation, I would know my true Course?

Lee-way to the Left-Hand ——— 1 Point.

Variation to the Left-Hand ———  $0 \frac{1}{2}$  Point.

Their Sum to be allowed to the Left-Hand  $1 \frac{1}{2}$  Points makes the true Course NW. by N.  $\frac{1}{2}$  W.

*Example 2d.* Suppose I steer SW. by W. with my Larboard Tacks Aboard, and make  $2 \frac{1}{2}$  Points Lee-way, and I have  $1 \frac{1}{4}$  Points Westerly Variation, what is my true Course?

Lee-way to the Right-Hand ———  $2 \frac{1}{2}$  Points

Variation to the Left-Hand ———  $1 \frac{1}{4}$

The Remainder to be allow'd to the Right-hand  $1 \frac{1}{4}$  Points, makes the true Course WSW.  $\frac{1}{4}$  W.

*Rule 4th.* When a Ship is lying too under a Main-sail, Mizzen, &c. then observe how she comes up and falls of, and take the middle between the two Points, and from that allow the Lee-way and Variation, as in *Rule 3d.*

*Example.* Suppose a Ship lying too under a Main-sail, with the Starboard Tack Aboard, comes up E. by S. and falls off to NE. by E. there being 1 Point Westerly Variation, and she making 5 Points Lee-way, what Course does she make good?

The middle between E. by S. and NE. by E. is E. by N. from which allowing 6 Points to the Left-Hand, (by *Rule 3d*) the true Course will be N. by E.

*Rule 5th.* Currents, the way they set you, and the Distance you suppose you are driven by them, is to be set in the Traverse Table for the Day, as any other Course and Distance.

*Example*

*Example*, Suppose I try the Current and find it to set W. by N. *per* Compass 1 Mile *per* Hour, the Variation being one Point Easterly, then if I sail in that Current 24 Hours, I set down in the Traverse Table, as a Course WNW. distance 24 Miles.

*Rule 6th*, Heave of the Sea, is to be accounted for in the same manner as Currents : As suppose, there is a great Sea heaving toward the SW. by my Compass, there being  $\frac{1}{2}$  Point Westerly Variation, I then set down in my Traverse-Table SW. by S.  $\frac{1}{2}$  W. with so much Distance as I judge, the Sea has heav'd the Ship.

*Rule 7th*, At leaving the Land, the opposite Point to the Bearing (with the Variation allow'd upon it) and the distance you judge yourself from it, must be set down in the Traverse-Table, as a Course and Distance.

*Example*, Suppose having  $1\frac{1}{4}$  Westerly Variation, the *Start* bears by my Compass NNE. distance 4 Leagues : The opposite Point to NNE. is SSW. which with the Variation makes S.  $\frac{1}{4}$  W. for the Course to be set in the Traverse-Table, distance 12 Miles.

*Rule 8th*, When you make the Land, the Bearing itself (with the Variation allow'd upon it) and the distance you judge yourself from it are to be set in the Traverse-Table, as a Course and Distance : This needs no Example.

*Note*, If you keep only the Account of Longitude made, and would at any Time know what Longitude you are in, look out the Longitude of the Place you took your Departure from, and with that Longitude, and the Longitude made, taken as Difference of Longitude, find the Longitude in, by the Rules in Page 107 and 108. And the Longitude so found must be counted from the same Meridian that the Tables you look'd out the Longitude of the Place Departed from, counts it.



*RULES to Correct the Dead-Reckoning by an Observation.*

**W**HEN you have made all the proper Allowances you can, such as for Variation, Lee-way, Currents, &c. and still find that your Latitude by Dead-Reckoning will not agree with the Latitude by Observation, within five Minutes, then you must Correct as follows :

*Case the First.*

*If your Course found by Dead-Reckoning be due North, or due South.*

*Rule,* First find the Difference of Latitude (in Miles) between the last Observation, and the Observation on the Day you Correct, which will be the true Difference of Latitude, then will your true Course be the same as the Course by Dead-Reckoning. Your true Distance the same as the true Difference of Latitude. Your Departure 00, and your Meridian Distance, Longitude made, (or Longitude in) will be the same as they were on the Day you had the last Observation.

*Case the Second.*

*If the Course found by Dead-Reckoning be less than 3 Points, or 33 Degrees.*

*Rule,* First find the Difference of Latitude (in Miles) between the last Observation, and the Observation on the Day you Correct, which will be the true Difference of Latitude. Then make your true Course the same as the Course found by Dead-Reckoning, since the last Observation, and with that Course, and the true Difference of Latitude, find the true Distance and Departure (*as in Plain Sailing, Case the 2d,*) then to find the Meridian Distance, the Longitude made, and the Longitude in, take the following Rule.

*N.B.* The Difference of Longitude is to be found by the true Course, and the Meridional Difference of Latitude between the two Observations (as usual,) and the Meridian Distance, Longitude made (or Longitude in) are to be found by adding, or subtracting the true Departure and Difference of Longitude to, or from the Meridian Distance, Longitude made (or Longitude in) on the Day you had the last Observation, which is the Day you always Correct from.

*Case*

## Case the Third.

*If the Course found by Dead-Reckoning be more than 3 Points or 33 Degrees, and less than 6 Points or 67 Degrees.*

*Rule,* First find the Difference of Latitude in Miles between the last Observation, and the Observation on the Day you Correct, which will be the true Difference of Latitude: Then with the Course found by Dead-Reckoning, since the last Observation, and the true Difference of Latitude, find a new Departure (*by the second Case of Plain Sailing*) add this new Departure to the Departure found by Dead-Reckoning since the last Observation, and take half their Sum for your true Departure: Then you have given the true Difference of Latitude and Departure to find your true Course and Distance, (*by Plain Sailing, Case 6th*) read here *N.B.* in Case the 2d.

## Case the Fourth.

*If the Course found by Dead-Reckoning be more than 6 Points or 67 Degrees.*

*Rule,* First find the Difference of Latitude in Miles, between the last Observation and the Observation on the Day you Correct, which will be the true Difference of Latitude, and make your true Departure the same as the Departure found by Dead-Reckoning since the last Observation: Then you have given the true Difference of Latitude and Departure, to find the true Course and Distance (*by Plain Sailing, Case 2d.*) read here *N.B.* in Case 2d.

*Note,* As the Knowledge of which Case you are to Correct by, depends upon knowing your Course by Dead-Reckoning, and as when you Correct only for one Day, that Course is always found by the Difference of Latitude and Departure in your Traverse-Table for that Day; therefore if you are to Correct for a longer Time than one Day, you must take the Northing, Southing, Easting and Westing that you have made for every Day since the last Observation, (or if it be your first Observation, then for every Day from your leaving the Land) minding not to leave out the Difference of Latitude and Departure for the Day you are Correcting on, and bring them into a Traverse-Table; by which you will find the whole Difference of Latitude and Departure, made by Dead-Reckoning since the last Observation, and with that same Difference Latitude and Departure,



## 132 Rules to Correct the Dead-Reckoning, &c.

find the Course made by Dead-Reckoning, then observe which of the foregoing Cases that Course comes under, and correct by the Rules for that Case, finding every Thing except the Distance.

And when you have so Corrected, you are to set down in your Book only the Latitude by Dead-Reckoning, the Latitude by Observation, the Meridian Distance and the Long. made (or Longitude in) and rub out the Course, Difference of Latitude and Departure.

Then you have given the Latitude by Observation on the Day you Correct, and the Latitude by Dead-Reckoning on the Day before it, to find the Difference of Latitude for the last 24 Hours, (by the Rules for Latitude, Page 105.) Also the Meridian Distance on the Day you Correct, and the Meridian Distance on the Day before it, to find your Departure, (by subtracting the Lesser from the Greater, if they are both East or both West; or by adding them together, if one be East and the other West.) And with that Difference of Latitude and Departure find your Course and Distance, (*by the 6th Case of Plain Sailing*) which Course, Distance, Difference of Latitude and Departure are to be set down instead of them you rubb'd out.

### *Rules to find the Meridian Distance.*

*Case 1st*, If the Meridian Distance on the Day you Work from be East, and you have sail'd to the Eastward; or if it be West, and you have sail'd to the Westward, then add the Departure to the Meridian Distance, and the Sum will be the Meridian Distance you have made, of the same Name with that you work'd from.

*Example* Meridian Distance ————— 4 18 W.  
 Departure Westerly 97 Miles, or — 1 37  
 Meridian Distance made in all — 5 55 W.

*Case 2d*, If your Meridian Distance be East, and the Departure be Westerly; or if the Meridian Distance be West, and Departure Easterly, then subtract the Lesser from the Greater, the Remainder will be the Meridian Distance you have made, of the same Name with the Greater of the two.

*Example 1st.* Meridian Distance ————— 7 34 W.  
 Departure Easterly ————— 1 16  
 Meridian Distance made in all 6 18 W.

*Example 2d.* Meridian Distance ————— 1 34 W.  
 Departure Easterly ————— 3 17  
 Meridian Distance made in all 1 43 E.

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A  
JOURNAL  
OF  
A VOYAGE from ENGLAND  
TOWARDS  
MADERA.

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H	K.	H K F.	Courfes	Winds	Lee-way	Transactions, <i>Thursday</i> <i>May the 1st, 1757.</i>		
2						Moderate Gales and fair Weather, at 6 (p.m.) the <i>Start</i> bore as <i>per</i> Log, from which I take my Departure, it being in the Latitude 50 07 N. and Longitude of 3 47 W. from <i>London</i>		
4								
6	The <i>Start</i> N by E. dist. 6 Leagues.							
8	4		SWbW	NE				
10	4	I						
12	5							
2	5		SW.			Variation $1\frac{1}{4}$ Point W.erly.		
4	5	I						
6	5	I						
8	5	I						
10	5	I						
12	6							
Course	Dist.	S	W	Lat. by D. R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in
S 30 00 W	108	93	53	48 34 N		00 53 W	01 22 W	5 07 E

*The Manner of Working this Day's Work.*

The opposite Point to the Bearing of the Land is S. by W. which with the Variation allow'd upon it (as before taught) makes S  $\frac{1}{4}$  E. and the Distance from the Land 6 Leagues or 18 Miles, which are to be set down for the first Course and Distance in the following Traverse-Table.

Then the first Course steer'd being SW by W. the Variation allow'd upon it will make it SW by S  $\frac{1}{4}$  W. and the Sum of all the Distances from 8 a Clock where that Course begins, to 2 a Clock where it ends, being 18 Miles and a half, I double that Sum, (because the Book is mark'd only for every Two Hours) and it makes 37 Miles for the Distance belonging to that Course. But if the Book had been mark'd for every Hour, as it is in the *Navy*, and Aboard the *East India* Ships, then I must have taken the Sum without doubling it for the Distance, and in the same manner I reckon the other Course and Distance; all which will be as in the following Traverse-Table.

And then every Thing being found as on the other Side, I set them down in their proper Columns as above.

Course

# The Traverse Table.

135

Courses	Dist.	N.	S.	E.	W.
S $\frac{1}{4}$ E.	18		18.0	0.9	
SW by S $\frac{1}{4}$ W.	37		27.4		24.8
SSW $\frac{1}{4}$ W.	56		48.0		28.8
Difference of Latitude S.			93.4	0.9	53.6
					0.9
					52.7

Dep. W.

The several Courses and Distances in this Table, being look'd out and cast up as in the Rules for Traverse Sailing, Page (52) I find my Difference of Latitude to be 93 Miles and 4 Tenths, and my Departure 52 Miles and 7 Tenths: Then I mark down (upon my Slate, or the Paper that I work upon) every Thing that is to be found, and as I find what they come to, I set against them as follows.

By D.R.	Courfe ——— S.	30 00 W	Because the Diff. Lat. is S. and the Depar. W. <i>Note</i> , When the Tenths in any Side are more than 5, or half a Mile, you must call that Side one Mile more than you found it to be; but when they are less than 5, then you need take no Notice of them. As in this Case the Diff. of Lat. being 93.4 I reject the 4 Tenths, and call it only 93 Miles, and the Dep. being 52.7, instead of the 7 Tenths I put one Mile to it, and call it 53 Miles.
	Distance ———	108 Miles	
	Diff. of Lat. ———	93 S.	
	Departure ———	53 W.	
	Lat. by D.R. ———	48 34 N	
	Lat. by Obser.		
	Meridian Distance	00 53 W.	
	Longitude made	01 22 W.	
	Longitude in —	05 07 W.	

But when you take the Difference of Latitude and Departure to find the Course by, then take them in Miles and Tenths.

Then in the first Place, with my Difference of Latitude 93,4 and my Departure 52,7 (as taught in Plane Sailing, *Case the 6th*) I find my Course to be 30 Degrees, and my Distance 108 Miles, which I set down against Course and Distance as above.

<i>Second</i> , For the Latitude by D.R.	<i>Third</i> , For the Merid. Distance.
Take the Latitude fail'd from 50 07 N.	<i>Note</i> , The Meridian Distance on the
And the Diff. Lat. 93 Miles, or 1 33	first Day's Work, is always the same as
Sub. (as <i>per</i> Rules) gives Lat. D.R. 48 34 N.	that Day's Dep. which here is 0 53 W.

<i>Fourth</i> , For the Diff. of Long.	Then I look for my Course 30 degrees,
The Meridional Parts of	in the Tables of Diff. of Lat. and Dep.
The Lat. fail'd from ——— } 3485	and for the Merid. Diff. of Lat. 142, in
Of the Lat. by D.R. 3343	some of the Diff. of Lat. Columns belong-
Meridional Difference of Lat. 142	ing to that Course, the Dep. 82 which an-
	swers to that Diff. Lat. is my Diff. Long.

<i>Fifth</i> , For the Longitude made.	<i>Sixth</i> , For the Longitude in.
The Long. made on the first Day's	Take the Longitude fail'd from 3 47 W.
Work is always the same as that Day's	And the Diff. Lon. 82 Miles, or 1 22 W.
Diff. of Long. which here is — 1 22 W.	Sub. (as <i>per</i> Rules) gives Lon. in 5 07 W.

H



H.	K.	H K F.	Courses	Winds	Lee-way	Transactions, <i>Friday</i> <i>May 2, 1757.</i>		
2	6		SW by W	N		Moderate Gales and fair Weather, at 8 (a. m.) saw a Ship to the Northward.		
4	5	I						
6	5			N W				
8	5							
10	4	I	S W					
12	4	I						
2	4	I				Variation $1\frac{1}{4}$ Point W.erly.		
4	4	I						
6	4	I						
8	5		SWbS.	WNW				
10	4	I						
12	4							
Course	Dist.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in
S 33 00 W	114	96	61	46 58 N		1 54 W	2 55 W	0 26 W

The Variation being allow'd, and the Distances summ'd up as before, the Traverse-Table will be as follows.

Course	Dist.	N.	S.	E.	W.
SWbS $\frac{1}{4}$ W	43		31.9		28.9
SSW $\frac{3}{4}$ W	45		38.6		23.1
SbyW $\frac{1}{2}$ W	27		25.4		9.1
Diff. of Lat. 95.9 Dep. 61.1					

*First*, With my Difference of Latitude 95.9 and Departure 61.1 (by Plain Sailing Case 6.) I find my Course to be 33 deg. and my Distance 114 Miles.

*Second*, For my Latitude by D. R.  
Take the Latitude in yesterday 48 34 N.  
And my Diff. Lat. 96 Miles, or 1 36  
Gives the Latitude by D. R.— 46 58 N.

*Third*, For the Meridian Distance,  
Take the Mer. Dist. yesterday 0 53 W.  
And the Departure to-day— 1 01  
Gives the Meridian Distance — 1 54 W.

By D. R.	Course—	S. 33 00 W.
	Distance—	114 Miles
	Diff. of Lat.—	96 S.
	Departure—	61 W.
	Latitude by D.R.	46 58 N.
	Latitude Observation	
	Meridian Distance—	1 54 W.
	Longitude made —	2 55 W.
	Longitude in—	0 26 W.

*Fourth*, For the Diff. of Longitude.  
Take the Mer. parts of yest. Lat. — 3343  
And of the Latitude to-day — 3200  
Gives the Mer. Diff. of Lat. — 143  
with which and the Course (as in the first Days Work) I find my Difference of Longitude to be 93 Miles.

*Fifth*, For the Longitude made.  
Take the Lon. made yesterday 1 22 W.  
And the Diff. of Lon. to-day } 1 33  
93 Miles, or —

Gives the Lon. made to-day 2 55 W.

*Sixth*, For the Longitude in,  
Take the Long. in yesterday 5 07 W.  
And the Diff. of Lon. to-day 1 33  
Gives the Longitude in — 6 40 W.

# A Journal from *England* towards *Madera*. 137

H.	K.	H K F.	Courfes	Winds	Lee-way	Tranfactions, <i>Saturday</i> <i>May 3d, 1757.</i>			
2	4		SW	WNW		Moderate Gales and Cloudy.			
4	4								
6	4								
8	4	I	SWbS	WbyN	$\frac{1}{2}$				
10	4	I							
12	4	I							
2	4	I	In 1st Reef both Topfails						
4	4		SSW	W	I				
6	4								
8	4					Variation 1 Point W.erly.			
10	4								
12	4								
Course	Dist.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon.made.	Lon. in	
S 14 00 W	97	95	24	45 23 N		2 18 W	3 29 W	7 14 W	

The Lee-way and Variation being allow'd as before taught, the Traverse-Table will be as follows,

Course	Dist.	N.	S.	E.	W.
S W by S	24		20.0		13.3
SbW $\frac{1}{2}$ W	36		34.5		10.4
South	40		40.0		
			94.5		23.7

*First*, The Course and Distance found (by Plain Sailing Cafe 6) as before, will be as in the other Column.

*Second*, For my Latitude by D. R.  
Take the Latitude in yesterday 46 58 N.  
And the Diff. of Latitude 95 } 1 35  
Miles, or —————  
Gives the Latitude by D. R. — 45 23 N.

*Third*, For the Meridian Distance,  
Take the Mer. Dist. yesterday 1 54 W.  
And the Departure to-day — 0 24  
Gives the Meridian Distance — 2 18 W.

By { Course ——— S. 14 00 W.  
Distance ——— 97 Miles  
Diff. of Lat. ——— 95 S.  
Departure ——— 24 W.  
Lat. by D. R. ——— 45 23 N.  
D.R. { Latitude Observ. —  
Meridian Distance 2 18 W.  
Longitude made — 3 29 W.  
Longitude in ——— 7 14 W.

*Fourth*, For the Diff. of Longitude,  
The Mer. Parts of yesterdays Lat. — 3200  
Of to-days Latitude ——— 3063

The Mer. Difference of Latitude — 137  
with which and the Course (as before) I find the Difference of Lon. to be 34 Miles.

*Fifth*, For the Longitude made.  
Take the Lon. made yesterday 2 55 W.  
And the Diff. of Lon. to-day 0 34  
Gives the Longitude made — 3 29 W.

*Sixth*, For the Longitude in,  
Take the Long. in yesterday 6 40 W.  
And the Difference of Longitude 0 34  
Gives the Longitude in — 7 14 W.

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138 A Journal from *England* towards *Madera*.

H	K.	H K F.	Courfes	Winds	Lee-way	Tranfactions, <i>Sunday</i> <i>May 4th, 1757.</i>			
2	4		S	W S W	I	Moderate Gales and Hazy the first part, the latter fresh Gales with Rain.			
4	4								
6	4	I							
8	4		In 2d Reef both Topfails						
10	4		S S E	S W	I $\frac{1}{2}$				
12	4								
2	4								
4	4								
6	4		Handed the Fore-top-fail						
8	4		S by E	SW by W	2	Variation 1 Point W.erly.			
10	4								
12	3	I		Tack'd					
Course		Dist.	S	E	Lat. by D. R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in
S 39 00 E		93	72	60	44 11 N		1 18 W	2 07 W	5 52 W

The Ship having her Starboard Tacks aboard, when the Lee-way and Variation are allow'd (as before taught) the Traverse Table will stand as follows.

Courfes	Dist.	N.	S.	E.	W.
S S E	33		30.5	12.6	
S E $\frac{1}{2}$ E	40		25.4	30.9	
S E	23		16.3	16.3	
			72.2	59.8	

By D.R. {  
 Course ——— S. 39 00 E.  
 Distance ——— 93 Miles  
 Diff. of Lat. ——— 72 S.  
 Departure ——— 60 E.  
 Latitude by D. R. — 44 11 N.  
 Latitude Observation  
 Meridian Distance — 1 18 W.  
 Longitude made — 2 07 W.  
 Longitude in ——— 5 52 W.

Having been very particular in explaining the manner of working a Days Work (in the three foregoing Days) and as all Days Works, where there is no Correction wanting, are to be work'd from the Difference of Latitude and Departure found by the Traverse Table (as before) I have here only set down the Traverse Table, and what all the other things come to, and have left the finding of them to exercise the Learner.

# A Journal from *England* towards *Madera*. 139

H.	K.	H K F.	Courses	Winds	Lee-way.	Transactions, <i>Monday</i> <i>May 5th, 1757.</i>			
2	4		NW by W	SW by W	2	Fresh Gales and Rain all these 24 Hours.			
4	3								
6	3								
8	3								
10	3		Hand Main Top-fail						
12	3	I	NW	WSW	3				
2	3	I				Variation 1 Point W.erly.			
4	3	I							
6	3								
8	3								
10	3		NW by N	W by S	3½				
12	3								
Course	Dist.	N	W	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in	
N 29 00 W	75	65	36	45 16 N		1 54 W	3 00 W	6 45 W	

The Ship having her Larboard Tacks Aboard, when the Lee-way and Variation are allow'd, the Traverse Table will stand as follows.

Courses	Dist.	N.	S.	E.	W.
NW.	32	22.6			22.6
NNW.	33	30.5			12.6
N½W.	12	11.9			1.2
		65.0			36.4

By	Course	N. 29 00 W.
	Distance	75 Miles
D.R.	Diff. of Lat.	65 N.
	Departure	36 W.
D.R.	Latitude D.R.	45 16 N.
	Latitude Observation	
D.R.	Meridian Distance	1 54 W.
	Longitude made	3 00 W.
D.R.	Longitude in	6 45 W.

*To find the Course.*

*Note,* In this Case the Difference of Latitude being just 65 Miles without any Tenths, after you have put two Cyphers to the Departure, you must not divide it by 65, but by 650, the Cypher being put to supply the place of Tenths, as directed in the Rules for Plain Sailing, see the Work.

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140 A Journal from *England* towards *Madera*.

H	K.	H K F.	Courses	Winds	Lee-way	Transactions, <i>Tuesday</i> <i>May 6th, 1757.</i>						
2	3		WNW	SW	3½	Hard Gales and Squally with Rain.						
4	3											
6	3		Handed the Fore-fail									
8	Lay too, up NW. off N.				5							
10	Drift 1 ½ Miles <i>per</i> Hour.											
12												
2			Up N byW.offNE byN			Variation 1 Point W.erly.						
4												
6												
8			Up N N W off N N E Set the Forefail.									
10												
12												
Course	Dist.	N	E	Lat. by D. R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in				
E 8 00 E	35	34	5	45 50 N		1 49 W	2 53 W	6 40 W				

Having allow'd the Lee-way and the Variation upon the first Course, and also from the Middle between what she comes up and falls off, (as taught in the Rules for Laying too,) the Traverse-Table will stand as follows.

Courses	Dist.	N.	S.	E.	W.
NW by N ½ W	18	13.9			11.4
N N E	12	11.1		4.6	
NE by E	9	5.0		7.5	
N E	6	4.2		4.2	
		34.2		16.3	11.4
				11.4	

Departure 4.9 E.

By	Course ———	N. 8 00 E.
	Distance ———	35 Miles
D.R.	Diff. of Lat. ———	34 N.
	Departure ———	5 E.
D.R.	Lat. by D.R. ———	45 50 N.
	Lat. by Observation	
D.R.	Meridian Distance	1 49 W
	Longitude made ———	2 53 W
D.R.	Longitude in ———	6 40 W

# A Journal from *England* towards *Madera*. 141

H.	K.	H K	F.	Courfes	Winds	Lee-way.	Tranfactions, <i>Wednesday</i> <i>May 7th, 1757.</i>			
2	3			N W	WSW	4	Fresh Gales the first Part, the latter Moderate, with fmall Showers.			
4	3			WNW	S W	4				
6	3			Set Main Top-fail.						
8	3	I		NW	WSW	3				
10	3	I		Set Fore-top-fail.						
12	3	I		W by S	S by W	2	Variation 1 Point W.erly.			
2	3	I		Out 2d Reefs both Top-fail						
4	4			W	S S W	1 $\frac{1}{2}$				
6	4									
8	4									
10	4									
12	4	I								
Courfe		Diff.	N	W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in	
N 54 00 W		72	42.58	46 32 N			2 47 W	4 17 W	8 04 W	

Courses	Dist.	N.	S.	E.	W.
N by W	12	11.8			2.3
NW by N	12	10.0			6.7
NNW	21	19.4			8.0
W	32				32.0
Wb N $\frac{1}{2}$ W	9	0.9			9.0
		42.1			58.0

By D.R.	Courfe	N. 54 00 W.
	Distance	72 Miles
	Diff. of Lat.	42 N.
	Departure	58 W.
	Latitude D.R.	46 32 N.
	Latitude Observation	
	Meridian Distance	2 47 W.
	Longitude made	4 17 W.
	Longitude in	8 04 W.

H



142 A Journal from *England* towards *Madera*.

H.	K.	H K F.	Courfes	Winds	Lee-way	Tranfactions, <i>Thursday</i> <i>May 8th, 1757.</i>		
2	4	1	W by N	SW b S	1	Moderate Gales and thick Hazy Weather.		
4	4	1						
6	4		Out 1ft Reef both Topfals					
8	4	1	W	S S W	$\frac{1}{2}$			
10	4	1						
12	4	1						
2	4		W by S	S by W	$\frac{1}{2}$	Variation 1 Point W.erly.		
4	4							
6	4							
8	4							
10	3	1	WSW	S	$\frac{1}{2}$			
12	3							
Courfe	Diff.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon.made.	Lon. in
S 82 00 W	95	13	95	46 19 N		4 22 W	6 33 W	10 20 W

Courfes	Diff.	N.	S.	E.	W.
W by N	26	5.1			25.5
W b S $\frac{1}{2}$ W	27		2.6		26.9
WSW $\frac{1}{2}$ W	32		9.3		30.6
SW by W $\frac{1}{2}$ W	13		6.1		11.5
		5.1	18.0		94.5
			5.1		
Difference Latitude			12.9		

By	{	Courfe	S. 82 00 W.
	{	Distance	95 Miles
	{	Diff. of Lat.	13 S.
	{	Departure	95 W.
D.R.	{	Lat. by D. R.	46 19 N.
	{	Latitude Observ.	
	{	Meridian Distance	4 22 W.
	{	Longitude made	6 33 W.
	{	Longitude in	10 20 W.

H

# A Jourual from *England* towards *Madera*. 143

H.	K.	H K F.	Courfes	Winds	Lee-way	Tranfactions, <i>Friday</i> <i>May 9, 1757.</i>			
2	2	I	WSW	S		Little Wind and small Showers of Rain.			
4	2	I							
6	2	I							
8	2								
10	2								
12	2								
2	I	I	SW by W	S by E		A great Swell from the SW. for which I allow 6 Miles.			
4	I	I							
6	I	I							
8	I								
10		I							
12		I							
						Variation 1 Point W.erly.			
Courfe		Diff.	S	W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in
S 57 00 W		34	19	29	46 00 N		4 51 W	7 55 W	11 2 W

Courfes	Diff.	N.	S.	E.	W.
SW by W	30		16.7		24.9
S W	10		7.1		7.1
NE by N	6	5.0		3.3	
		5.0	23.8	3.3	32.0
			5.0		3.3
			18.8		28.7

By	Courfe	— S. 57 00 W
	Distance	— 34 Miles
D.R.	Diff. of Lat.	— 19 S.
	Departure	— 29 W.
D.R.	Lat. by D.R.	— 46 00 N.
	Lat. by Observation	
D.R.	Meridian Distance	4 51 W
	Longitude made	— 7 15 W
D.R.	Longitude in	— 11 02 W

*Note,* In this Days Work the Swell coming from the SW. heaves the Ship towards the NE. and the Variation allowed upon it makes NE. by N. for the last Course in the Traverse Table.

H



144 A Journal from *England* towards *Madera*.

H.	K.	H	K	F.	Courses	Winds	Lee-way	Transactions, <i>Saturday</i> <i>May 10, 1757.</i>	
2					Calm			Tried the Current and found it to set WSW. 1 Mile <i>per</i> Hour, at which Rate I allow it for this 24 Hours.	
4									
6									
8									
10									
12								Zenith Distance 27 52 S. Declination — 17 41 N.	
2									
4									
6								Variation 1 Point W.erly.	
8	1				S S W	W			
10	2								
12	2		1						
Course		Dist.	S	W	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in
S 42 00 W		32	24	22	45 36 N	45 33 N	5 13 W	7 50 W	11 37 W

Courses	Dist.	N.	S.	E.	W.
S by W	11		10.8		2.1
SW by W	24		13.3		20.0
			24.1		22.1

Course ——— S. 42 00 W.  
 Distance ——— 32 Miles  
 Diff. of Latitude - 24 S.  
 Departure ——— 22 W.  
 Latitude by D.R. 45 36 N.  
 Latitude Observ. - 45 33 N.  
 Meridian Distance 5 13 W.  
 Longitude made — 7 50 W.  
 Longitude in ——— 11 37 W.

*Note,* The Current setting WSW. 1 Mile *per* Hour, I allow the Variation upon it, which makes it SW. by W. and set it in the Traverse Table, with 24 Miles Distance, as above.

# A Journal from *England* towards *Madera*. 145

H.	K.	H K	F.	Courses	Winds	Lee-way	Transactions, <i>Sunday</i> <i>May 11th, 1757.</i>		
2	3			S by W	W by S		Moderate Gales and fair Weather, at 9 (a. m.) spoke with a Ship from <i>Barbadoes</i> , and bound for <i>London</i> .		
4	3	I							
6	4								
8	4		W						
10	4								
12	4								
2	4								
4	4								
6	4								
8	4								
10	4						Variation 1 Point W.erly.		
12	4								
Courfe	Dist.	S.	—	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon.made.	Lon. in	
South	103	103	—	44 00 N	43 50 N	5 13 W	7 50 W	11 37 W	

By D.R. since last Obser.

Courfe	—	South
Distance	93	Miles
Difference of Lat.	- 93	
Departure	00	
Latitude by D.R.	44 00 N.	
Latitude Observ.	43 50 N.	

Corrected

Courfe	—	South
Distance	103	Miles
Diff. of Lat.	103 S.	
Departure	00	
Lat. by D. R.	44 00 N.	
Latitude Observ.	43 50 N.	
Meridian Distance	5 13 W.	
Longitude made	7 50 W.	
Longitude in	11 37 W.	

In this Days Work, there being 10 Miles Difference between the Latitude by Dead-Reckoning and Observation, I am to Correct, and therefore I do not find the Meridian Distance &c. by (D.R.) as I did when there was no Correction; but I mark them all down again as above, and Correcting (as in Case the First, of the Rules for Correcting) because my Course by D.R. since the last Observation was due South, I set them all down, as in the above Correction.

U

H



146 A Journal from *England* towards *Madera*.

H.	K.	H K	F.	Courses	Winds	Lee-way.	Transactions, <i>Monday</i> <i>May 12th, 1757.</i>			
2	4			SW b S	W N N		Moderate Gales and fine clear Weather.			
4	4	I								
6	4	I								
8	4	I								
10	4									
12	4									
2	4	I		S S W			Variation 1 Point W.erly.			
4	4	I								
6	4									
8	4									
10	4									
12	4	I								
Course		Diff.	S	W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in	
S 18 00 W		112	106	35	42 13 N	42 04 N	5 48 W	8 37 W	12 24 W	

Courses	Diff.	N.	S.	E.	W.
S S W	60		55.4		23.0
S by W	42		41.2		8.2
			96.6		31.2

Cor-  
rected.

{ Course ——— S. 18 00 W.  
Distance ——— 112 Miles  
Diff. of Lat. ——— 106 S.  
Departure ——— 35 W.  
Latitude by D. R. — 42 13 N.  
Latitude Observation 42 04 N.  
Meridian Distance — 5 48 W.  
Longitude made — 8 37 W.  
Longitude in ——— 12 24 W.

By  
D.R.  
since  
last  
Obfer.

{ Course ——— S. 18 00 W.  
Distance ——— 102 Miles  
Diff. of Lat. — 97 S.  
Departure ——— 31 W.  
Latitude D. R. 42 13 N.  
Latitude Obfer. 42 04 N.

Having found as far as to the Latitude by  
Dead-Reckoning and Observation, I see they  
differ 9 Miles, therefore I Correct (by Case  
the 2d.) because my Course found by Dead-  
Reckoning since the last Observation, is less  
then 33 Degrees, and the result is as above.

H

# A Journal from *England* towards *Madera*. 147

H.	K.	H K	F.	Courses	Winds	Lee-way	Transactions, <i>Tuesday</i> <i>May 13th, 1757.</i>		
2	4			SW	NW		Moderate and Fair.		
4	4	I							
6	4								
8	4								
10	3	I		SWbW			Variation $\frac{1}{4}$ Point W.erly.		
12	4								
2	4								
4	3	I			N.				
6	3	I					Variation $\frac{1}{4}$ Point W.erly.		
8	3	I							
10	3	I							
12	3	I			NE.				
Course		Dist.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon. made.	Lon. in
S 47 00 W		78	53	57	40 59 N	41 11 N	6 45 W	9 53 W	13 40 W

Courses	Dist.	N.	S.	E.	W.
SWbS $\frac{1}{4}$ W	33		26.5		19.7
S W $\frac{1}{4}$ W	58		38.9		43.0
			65.4		62.7

Cor- rected	{	Course	—	S. 47 00 W.
	{	Distance	—	78 Miles
	{	Diff. of Lat.	—	53 S.
	{	Departure	—	57 W.
	{	Lat. by D. R.	—	40 59 N.
	{	Latitude Observ.	—	41 11 N.
	{	Meridian Distance	—	6 45 W
	{	Longitude made	—	9 53 W
	{	Longitude in	—	13 40 W

By D.R. since last Obser.	{	Course	—	S. 44 00 W.
	{	Distance	—	91 Miles
	{	Difference of Lat.	—	65 S.
	{	Departure	—	63 W.
	{	Latitude by D.R.	—	40 59 N.
	{	Latitude Observ.	—	41 11 N.

New Departure	—	51
Departure by D.R.	—	63
Their Sum	—	114

$\frac{1}{2}$  Sum, or true Dep. 57 Miles

In this Case, the Course by D.R. since last Observation being more than 33, and less than 67 Degrees, I Correct by Case the 3d.



148 A Jourual from *England* towards *Madera*.

H.	K.	H K F.	Courfes	Winds	Lee-way	Tranfactions, <i>Wednesday</i> <i>May 14, 1757.</i>		
2	4		W.	S E		Cloudy the first part, the latter moderate and Fair.		
4	4							
6	4							
8	4							
10	4			E				
12	4							
2	4					Variation $\frac{1}{2}$ Point W.erly.		
4	4							
6	4							
8	3	I						
10	3	I						
12	3	I		N N E				
Courfe	Diff.	—	W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in
West	93	—	93	41 02 N	41 11 N	8 18 W	11 56 W	15 43 W

Courfes	Diff.	N.	S.	E.	W.
W by S $\frac{1}{2}$ W	93		9.1		92.6
		Diff. Lat.			Dep

Corrected by Case the 4th, the Courfe by D.R. being more than 6 Points.

By  
D. R.  
fin  
laft  
Obfer.

{ Courfe — W. by S.  $\frac{1}{2}$  W.  
Distance — 93 Miles  
Diff. of Lat. — 9 S.  
Departure — 93 W.  
Latitude D.R. — 41 02 N.  
Latitude Obfer. — 41 11 N.

Cor-  
rected.

{ Courfe — — — — — West  
Distance — — — — — 93 Miles  
Diff. of Lat. — — — — — 00  
Departure — — — — — 93 W.  
Lat. by D.R. — — — — — 41 02 N.  
Lat. by Observation — — — — — 41 11 N.  
Meridian Distance — — — — — 8 18 W  
Longitude made — — — — — 11 56 W  
Longitude in — — — — — 15 43 W

*Note*, When the Courfe is due East or due West, as in this Cafe, then the Difference of Longitude cannot be found by the Courfe, and Meridional Difference of Latitude as before, but must be found as follows; look in the Tables of Difference of Latitude and Departure, for the nearest Degree to your Latitude, which here is 41, and in some of the Difference of Latitude Columns belonging to that Degree find your Departure, which in this Cafe is 93, the Distance answering to that which 123, gives your Difference of Longitude.

# A Journal from *England* towards *Madera*. 149

H	K.	H K F.	Courses	Winds	Lee-way	Transactions, <i>Thursday</i> <i>May the 15th, 1757.</i>		
2	4		S by W.	N		Little Wind and Hazy all these 24 Hours.		
4	3	I						
6	3	I						
8	3							
10	3		S S W	N W				
12	3							
2	3							
4	3							
6	3		SbW $\frac{1}{2}$ W.	WNW				
8	3							
10	3					Variation $\frac{1}{2}$ Point W.erly.		
12	3							
Course	Dist.	S	W	Lat. by D. R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in
S 11 00 W	76	74	14	39 57 N		8 32 W	12 15 W	16 02 W

Courses	Dist.	N.	S.	E.	W.
S $\frac{1}{2}$ W	28		27.9		2.7
SbW $\frac{1}{2}$ W	24		23.0		7.0
S by W	24		23.5		4.7
			74.4		14.4

By D.R.	{	Course	—	S. 11 00 W.
	{	Distance	—	76 Miles
	{	Diff. of Lat.	—	74 S.
	{	Departure	—	14 W.
	{	Latitude by D. R.	—	39 57 N.
	{	Latitude Observation		
	{	Meridian Distance	—	8 32 W.
	{	Longitude made	—	12 15 W.
	{	Longitude in	—	16 02 W.

*Note*, Having in the foregoing Days Works given an Example to every Case of Correcting, (for a single Day) I shall now set down two or three Days Works by D.R. and then shew how to Correct them all together by an Observation, that is, how to Correct for a longer Time than one Day.



150 A Journal from *England* towards *Madera*.

H	K.	H K F.	Courfes	Winds	Lee-way	Transactions, <i>Friday</i> <i>May the 16th, 1757.</i>						
2	3	I	S S W.	W by N		Little Wind and Cloudy.						
4	3	I										
6	4											
8	4		S by W	W	Variation $\frac{1}{4}$ Point W. erly.							
10	4											
12	3	I										
2	3	I	S.	WSW.								
4	3	I										
6	3											
8	3		SbW $\frac{1}{2}$ W.	W								
10	3											
12	3	I										
Course	Dist.	S	W	Lat. by D. R.					Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in
S 12 00 W	83	82	17	38 35 N						8 49 W	12 38 W	16 25 W

Courfes	Diff.	N.	S.	E.	W.
SbW $\frac{1}{4}$ W.	30		28.2		10.1
S $\frac{1}{4}$ W	29		28.7		4.3
S $\frac{1}{4}$ E.	12		12.0	0.6	
SbW $\frac{1}{4}$ W	13		12.6		3.2
			81.5	0.6	17.6
					0.6
					Dep. 17.0

By D. R.	{	Course	S. 12 00 W.
	{	Distance	83 Miles
	{	Diff. of Lat.	82 S.
	{	Departure	17 W.
	{	Latitude by D.R.	38 35 N.
	{	Latitude Observation	
	{	Meridian Distance	8 49 W.
	{	Longitude made	12 38 W.
	{	Longitude in	16 25 W.

# A Jourual from *England* towards *Madera*. 151

H.	K.	H K F.	Courfes	Winds	Lee-way	Tranfactions, <i>Saturday</i> <i>May 17, 1757.</i>			
2	3	I	SbW $\frac{1}{4}$ W	WbyN		Little Wind and fair Weather.			
4	3	I							
6	3	I							
8	3								
10	3	I							
12	3								
2	3		S by W	W		Variation $\frac{1}{4}$ Point W.erly.			
4	2								
6	3								
8	3								
10	3								
12	3								
Course		Dist.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in
S 14 00W		74	72	17	37 23N		9 06W	13 1 W	16 48w

Courfes	Diff.	N.	S.	E.	W.
S by W $\frac{1}{2}$ W	46		44.0		13.3
S $\frac{1}{4}$ W.	28		27.7		4.1
			71.7		17.4

By {  
D.R. { Course — S. 14 00 W.  
Distance — 74 Miles  
Diff. of Lat. — 72 S.  
Departure — 17 W.  
Lat. by D.R. — 37 23 N.  
Lat. by Obfer.  
Meridian Distance 9 06 W  
Longitude made 13 01 W  
Longitude in — 16 48 W



152 A Journal from *England* towards *Madera*.

H.	K.	H K F.	Courses	Winds	Lee-way.	Transactions, <i>Sunday</i> <i>May 18th, 1757.</i>			
2	4		S by W	W by N		Moderate Gales and Fair			
4	4								
6	4								
8	4								
10	4								
12	4								
2	4		S b W $\frac{1}{4}$ W			Variation $\frac{1}{4}$ Point W.erly.			
4	4								
6	4								
8	4								
10	4								
12	4								
Course		Dist.	S	W	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in
S 9 00 W		108	107	17	35 48 N	35 36 N	9 23 W	13 19 W	17 06 W

Courses	Dist.	N.	S.	E.	W.	By D.R. since yester- day Noon.	Course — S. 10 00 W.	
S $\frac{1}{4}$ W	48		47.5		7.0		Distance —	96 Miles.
S by W	48		47.1		9.4		Diff. of Lat. —	95 S.
			94.6		16.4		Departure —	16 W.
							Latitude D. R.	35 48 N.
							Latitude Obser.	35 36 N.

Now being to Correct from the last Observation, which was on *Wednesday May 14th*, I take the Northing, Southing, Easting and Westing for every Day since, and bring them into a Traverse Table as follows,

		N.	S.	E.	W.
By D.R. since the last Obser- vation.	On <i>Thursday, May 15</i>		74		14
	On <i>Friday the 16</i>		82		17
	On <i>Saturday the 17</i>		72		17
	On this Day as above		95		16

Whole Diff. of Lat. by D.R. S. 323 Dep. 64 W.

Gives Course by D.R. since last Observ. S. 11 00 W.

My

My Course found by D. R. since the last Observation, being S. 11 00 W. which is less than 33 Degrees, I am to Correct by Case the 2d, and to find every thing except the Distance, as follows.

*First, For the True Difference of Latitude.*

Take the Latitude last Observation	— — —	41 11 N.
And the Latitude by Observation To-day	— — —	35 36 N.
Gives the Difference of Latitude	— — —	5 35
Which multiplied by 60, makes	— — —	335 Miles.

*Second, For the True Course.*

The Course by D. R. since the last Observation, being S. 11 00 W. I set it down for the true Course, as *per* Rule in Case 2d.

*Third, For the True Departure.*

With the true Course 11 Degrees, and the True Difference of Latitude (divided by 2, because too big to be found in the Tables) which makes it 167.5, (by *Plain Sailing*, Case the 2d) I find the Departure 32.6 which multiplied by the same Number the Difference of Latitude was divided by, *viz.* 2, gives 65.2 Tenths for the true Departure.

*Fourth, For the Meridian Distance.*

Take the Meridian Distance last Observation	— — —	8 18 W.
And the True Departure	— — —	1 05
Gives the Meridian Distance To-day	— — —	9 23 W.

*Fifth, For the Difference of Longitude.*

Take the Meridional Parts of last Observation	— — —	2716
And Meridional Parts of To-days Observation	— — —	2288
Gives Meridional Difference of Latitude	— — —	428
With the Half of which	— — —	214

(because the whole is too big to be found in the Tables) and the True Course 11 Degrees I find the Difference of Longitude 41.6, which doubled because the other was halv'd, gives for the whole Difference of Longitude 83 Miles.

X

Sixth,



152 A Journal from *England* towards *Madera*.

H.	K.	H K F.	Courses	Winds	Lee-way.	Transactions, <i>Sunday</i> <i>May 18th, 1757.</i>			
2	4		S by W	W by N		Moderate Gales and Fair			
4	4								
6	4								
8	4								
10	4								
12	4					Variation $\frac{1}{4}$ Point W.erly.			
2	4		S b W $\frac{1}{4}$ W						
4	4								
6	4								
8	4								
10	4								
12	4								
Course		Dist.	S	W	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in
S 9 00 W		108	107	17	35 48 N	35 36 N	9 23 W	13 19 W	17 06 W

Courses	Dist.	N.	S.	E.	W.	By D.R. since yester- day Noon.	Course — S. 10 00 W.	
S $\frac{1}{4}$ W	48		47.5		7.0		Distance —	96 Miles.
S by W	48		47.1		9.4		Diff. of Lat. —	95 S.
			94.6		16.4		Departure —	16 W.
							Latitude D. R.	35 48 N.
							Latitude Obser.	35 36 N.

Now being to Correct from the last Observation, which was on *Wednesday May 14th*, I take the Northing, Southing, Easting and Westing for every Day since, and bring them into a Traverse Table as follows,

By D.R. since the last Obser- vation.		N.	S.	E.	W.
	On <i>Thursday, May 15</i>		74		14
	On <i>Friday the 16</i>		82		17
	On <i>Saturday the 17</i>		72		17
	On this Day as above		95		16

Whole Diff. of Lat. by D.R. S. 323 Dep. 64 W.

Gives Course by D.R. since last Observ. S. 11 00 W.

My

My Course found by D. R. since the last Observation, being S. 11 00 W. which is less than 33 Degrees, I am to Correct by Case the 2d, and to find every thing except the Distance, as follows.

*First, For the True Difference of Latitude.*

Take the Latitude last Observation	— — — — —	41 11 N.
And the Latitude by Observation To-day	— — — — —	35 36 N.
Gives the Difference of Latitude	— — — — —	5 35
Which multiplied by 60, makes	— — — — —	335 Miles.

*Second, For the True Course.*

The Course by D. R. since the last Observation, being S. 11 00 W. I set it down for the true Course, as *per* Rule in Case 2d.

*Third, For the True Departure.*

With the true Course 11 Degrees, and the True Difference of Latitude (divided by 2, because too big to be found in the Tables) which makes it 167.5, (by *Plain Sailing*, Case the 2d) I find the Departure 32.6 which multiplied by the same Number the Difference of Latitude was divided by, *viz.* 2, gives 65.2 Tenths for the true Departure.

*Fourth, For the Meridian Distance.*

Take the Meridian Distance last Observation	— — — — —	8 18 W.
And the True Departure	— — — — —	1 05
Gives the Meridian Distance To-day	— — — — —	9 23 W.

*Fifth, For the Difference of Longitude.*

Take the Meridional Parts of last Observation	— — — — —	2716
And Meridional Parts of To-days Observation	— — — — —	2288
Gives Meridional Difference of Latitude	— — — — —	428
With the Half of which	— — — — —	214

(because the whole is too big to be found in the Tables) and the True Course 11 Degrees I find the Difference of Longitude 41.6, which doubled because the other was halv'd, gives for the whole Difference of Longitude 83 Miles.



Sixth, *For the Longitude made.*

Take the Longitude made last Observation ——— 11 56 W.  
 And the whole Difference of Longitude ——— 1 23  
 Gives the Longitude made ——— 13 19 W.

Seventh, *For the Longitude in,*

Take the Longitude in last Observation ——— 15 43 W.  
 And the whole Diff. of Longitude ——— 1 23  
 Gives the Longitude in ——— 17 06 W.

Corrected {	{	Course ——— S. 11 00 W.	} these to be found again as follows.	{	S. 9 00
		Distance ———			108 Miles
		Difference of Latitude ——— 335 S.			107 S.
		Departure ——— 65 W.			17 W.
		Latitude by D. R. ——— 35 48 N.			
		Latitude by Observation 35 36 N.			
		Meridian Distance ——— 9 23 W.			
		Longitude made ——— 13 19 W.			
{	{	Longitude in ——— 17 06 W.			

The Course, Difference of Latitude and Departure as above, being what has been made since the last Observation, which was 4 Days ago) and as it is usual to set them down only as they are made from Noon to Noon, therefore they are to be rubb'd out, and found again as follows.

*First,* Take the Latitude by D. R. Yesterday ——— 37 23 N.  
 And the Latitude by Observation To-day ——— 35 36 N.  
 Gives the Difference of Latitude ——— 1 47

*Second,* Take the Meridian Distance Yesterday ——— 9 06 W.  
 And the Meridian Distance To-day ——— 9 23 W.  
 Gives the Departure ——— 0 17

Then with the Difference of Latitude 107, and the Departure 17 Miles, (by *Plain Sailing*, Case 6.) I find the Course to be 9 Degrees, Distance 108 Miles as above.

H.	K.	H K F.	Courfes	Winds	Lee-way	Transactions, <i>Monday</i> <i>May 19, 1757.</i>			
2	5		S by W	N.		<p>By Reckoning I make my Course from the <i>Start</i> to the Island of <i>Madera</i>, S. 32 00 W. Distance 420 Leagues, Meridian Distance and Difference of Longitude as underneath.</p> <p>At Noon saw the Island of <i>Madera</i>, bearing S. W. by W. Distance 14 Leag. Variation 00.</p>			
4	6								
6	6	I							
8	7								
10	7	I							
12	8								
2	8								
4	8								
6	8	I							
8	8	I							
10	9								
12	9								
Courfe	Diff.	S	W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in	
S 19 00 W	213	202	70	32 14 N		10 33 W	14 43 W	18	20 W

Courfes	Diff.	N.	S.	E.	W.
S by W	182		178.5		35.5
SWbW	42		23.3		34.9
			201.8		70.4

The Bearing of the Land being SW. by W. distant 14 Leagues, or 42 Miles, I set them in the Traverse Table as a Course, &c.

Course ——— S. 19 00 W.  
 Distance ——— 213 Miles  
 Diff. of Latitude - 202 S.  
 Departure ——— 70 W.  
 Latitude by D.R. 32 14 N.  
 Meridian Distance 10 33 W.  
 Longitude made — 14 43 W.  
 Longitude in ——— 12 14 W.

It being Customary upon making the Land, to find what Course and Distance the Ship has made by Reckoning from the Place sail'd from, to the Place arrived at, it is to be done as follows.

### CASE the First, *When you keep the Account of Longitude in,*

With the Latitude and Longitude of the Place you sail'd from, and the Latitude and Longitude you are in by your Reckoning, on the Day you make the Land, find the proper Difference of Latitude, the Meridional Difference of Latitude, and the Difference of Longitude in Miles, and with them find the Course and Distance (as it is shewn at large in Mercator's Sailing, Case the First, Page 55.



**CASE the Second, When you keep the Account of Longitude made.**

Then the proper Difference of Latitude, and the Meridional Difference of Latitude, are to be found as before, and the Difference of Longitude is to be found by bringing the Longitude made into Miles, with which proceed as in Case the First.

The Agreement between these two Ways may be seen as follows.

On the 19th of May, when I made the Land, my Longitude in was ——— 18 30 W. Longitude of the Start or

Place I failed from 3 47 E.  
The Diff. of Longit. 14 43  
Which multiplied by — 60  
Makes ——— 883 Miles

On the same Day my Longitude made was ——— 14 43 W.  
Which multiplied by ——— 60  
Makes the Diff. of Lon. 883 Miles  
the same as in the other Case.

*To find the Bearing and Distance of any Place from the Ship, upon any given Day.*

*Example.* Suppose I would know how *Madera* bore off me, and what Distance on the 14th of May, by the foregoing Journal

*First,* Supposing I kept only the Account of Longitude in,  
Then, with the Latitude in 41 11 N. } 2716  
And the Latitude of *Madera* 32 44 N. } 2080  
I find the proper Diff. of Lat 8 27 } 636  
Which multiplied by 60 makes 507 } M.D.L. {  
Miles. } And with Lon. in — 15 43 W.  
And the Lon. *Madera* 17 26 W.  
I find the Diff. Lon. 1 43  
Which makes — 103 Miles.

Then with that Meridional Difference of Latitude, and Difference of Longitude, I find the Course to be S. 09 00 W. and the Distance 500 Miles, (as in *Mercator*, Case 1.)

But if I had kept only the Account of Longitude made, (which is Difference of Longitude) Then,

With the Longitude fail'd from ——— 3 47 W.  
And the whole Diff. of Lon. or Lon. made 11 56 W. erly  
By the Rules for Longitude (Page 107) I  
should have found the Lon. in to be — 15 43 W.

And then I have given the Latitude and Longitude in, &c. as before.

I have in the foregoing Journal shewn how to Correct either for a single Day, or for a longer Time, and given Examples of every Case, for Correcting from one Observation to another; but as it may happen that you may be some Days at Sea, from the Time of your leaving

leaving the Land before you have an Observation, and that when you get that first Observation you may have Occasion to Correct, (and there being much the same Difference between working the Correction from one Observation to another; and between the first Observation and the Land, as there is between working the first Days Work and any of the following ones) I shall here give an Example from the foregoing Journal.

*To Correct from the Time of leaving the Land, to the First Observation.*

*Example.* Suppose that in the foregoing Journal, on the 3d of May, I was by Observation in the Latitude 45 10 N. my Latitude by D. R. being 45 23 N. my Southing by D. R. 95, and Westing 24.

Now being to Correct, and having no Observation before To-day, I must Correct from the very Beginning of my Journal, that is, from the Time of my leaving the Land, by bringing the Northing, Southing, Easting and Westing, (for every Day I have been at Sea) into a Traverse-Table as follows.

	N.	S.	E.	W.
By D. R. from the Time of leaving the Land				
On the first Day.		93		53
On the second Day.		96		61
On the Day I Correct		95		24
Whole Diff. of Lat. by D. R. S. 284 Dep. 138 W.				
Gives the Course by D. R. from the time of leaving the Land S. 26 00 W.				

The Course found by D. R. from the Time of leaving the Land; being less than 33 Degrees, I am to Correct by Case the Second, and to find every thing except the Distance, as follows.

*First, For the true Difference of Latitude.*

Take the Latitude of the Place sail'd from 50 07 N.

And the Latitude in by Observation ——— 45 10 N.

Gives the true Difference of Latitude ——— 4 57 or 297 Miles

*Second, For the true Course.*

The Course by D. R. since the Time of leaving the Land being S. 26 00 W. I set it down for the True Course, as per the Rules for Correcting, Case 2d.

Third,



Third, *For the True Departure.*

With the true Course 26 Degrees, and half the True Difference of Latitude 148.5, (because the whole is too big to be found in the Tables) by *Plain Sailing*, Case the 2d. I find the Departure 72.3, which being doubled (because the Difference of Latitude was halv'd) gives 144.6 for the true Departure.

Fourth, *For the Meridian Distance.*

Whenever you Correct from the Time of your leaving the Land, (as you do here) the Meridian Distance will always be the same as the True Departure found by Correcting, which in this Case is 145 Miles, or 2 25 W.

Fifth, *For the Difference of Longitude.*

Take the Meridional Parts of the Latitude sail'd from	3485
And of the Latitude in by Observation	3044
Gives the Meridional Difference of Latitude	441

With the half of which 220,5 (because the whole is too big to be found in the Tables) and the True Course 26 Degrees, (as directed in the First Day's Work, p. 134) I find the Difference of Longitude 107.4. which doubled (because the other was halv'd) gives the true Difference of Longitude 214,8.

Sixth, *For the Longitude made.*

Whenever you Correct from the Time of your leaving the Land, (as you do in this Case) then the Longitude made will always be the same as the whole Difference of Longitude found by the Correction, which in this Case is 215 Miles, or 3 35 W.

Seventh, *For the Longitude in.*

Take the Longitude of the Place you sail'd from	3 47 W.
And the whole Difference of Longitude	3 35
Gives the Longitude in	7 22 W.

Corrected {	Course	S. 26 00 W.	} these to be found again {	S. 16 00 W.
	Distance			113 Miles
	Difference of Latitude	297 S.		108 S.
	Departure	145 W.		31 W.
	Latitude by D. R.	45 23 N.		
	Latitude by Observation	45 10 N.		
	Meridian Distance	2 25 W.		
	Longitude made	3 35 W.		
	Longitude in	7 22 W.		

The Course, Difference of Latitude and Departure as above, being what has been made in the whole, from the Time of leaving the Land (which is three Days)

Days) and as it is usual to set them down only as they are made from Noon to Noon, therefore they are to be rubb'd out, and found again as follows.

First, Take the Latitude by D.R. Yesterday	_____	_____	46	58 N.
And the Latitude by Observation To-day	—	—	45	10 N.
Gives the Difference of Latitude	—	—	1	48

Second, Take the Meridian Distance Yesterday	_____	_____	1	54 W.
And the Meridian Distance To-day	—	—	2	25 W.
Gives the Departure	—	—	0	31

Then with the Difference of Latitude 108, and the Departure 31 Miles, (by *Plain-Sailing*, Case 6,) I find the Course to be S. 16 00 W. Distance 113 Miles, as above.

Having in the preceeding Journal shewn how to find what Latitude and Longitude the Ship is in, on any Day, I shall in the next place shew how,

*By that Latitude and Longitude in, to prick off the Place of the Ship on the Mercator's Chart.*

*Rule.* Lay a Ruler a-cross the Chart, in the Latitude your Ship is in, then look upon the Equinoctial, or Line marked with the Degrees of Longitude, for the Longitude your Ship is in by your Reckoning, and setting one Foot of your Compasses in that Longitude, take the nearest Distance to some North and South Line, and from where that Line crosses the Edge of the Ruler that lays in the given Latitude, lay off that same Distance (by the Edge of the Ruler) to the Right-hand, if the Longitude you are in was to the Right-hand of the North and South Line: Or to the Left-hand if it was to the Left, where this falls will be the Place of the Ship. But this will only do when the Longitude mark'd on the Chart and your Reckoning of Longitude in, are both counted from the same Meridian, therefore for a general Rule take the following, *viz.*

*By the Latitude in, and Longitude made, to prick off the Ship's Place, &c.*

*Rule,* Set one Foot of your Compasses in the Place you take your Departure from, and take the nearest Distance to some North and South Line, and from where that Line falls upon the Equinoctial, or Line mark'd with the Degrees of Longitude, set off that Distance, the same way as the Place lays from it, (that is to the Right-hand, if the Place lay to the Right-hand of the North and South Line, or to the Left-hand if it lay to the Left) and make a mark with a Black Lead Pencil; this Mark will serve to prick off by, till you come to take a New Departure, and then you rub it out and make a new one, as before.

Then, lay a Ruler a-cross the Chart in the Latitude you are in, and taking so many Degrees in your Compasses (from the Line of Longitudes) as your Longitude made comes to, set them off from your Black Lead Mark, to the Eastward, if the Longitude made be East, or to the Westward if it be West; where



where this falls will be the Longitude the Ship is in by the Chart, from which take the nearest Distance to some North and South Line, and from where that Line, &c. as in the first Case.

The Ship's Place on the Chart being found as before taught; it remains in the next Place to shew how to find the Bearing and Distance of any Place from the Ship; and First,

*To find how any Place bears from the Ship.*

*Rule.* Lay a Ruler from the Place of the Ship to the Place you would know the Bearing of, then set one Foot of your Compass in the Center of some Compass near the Ruler, and take the nearest Distance to the Edge of the Ruler; then run one Foot of your Compasses along by the Edge of the Ruler, and observe what Point of the Compass the other comes nearest to, which will be the Bearing required.

*To find the Distance of any Place from the Ship.*

*Case the 1<sup>st</sup>,* If the Place be in the same Longitude that the Ship is in, (that is, if it bears due North or due South) then the Difference of Latitude between them (found as by the Rules for Latitude, Page 105) and turn'd into Miles or Leagues will be the Distance.

*Case the 2<sup>d</sup>,* If the Place be in the same Latitude that the Ship is in, (that is, if it bears due East or due West) then take half the Distance between the Ship and the Place, in your Compasses, and setting one Foot (on the Line mark'd with the Degrees of Latitude) in the Latitude the Ship is in, see what Latitudes the other Foot will reach to, both above and below it; the Difference between these two Latitudes, (found as *per* Rules for Latitude) will be the Distance required.

*Case the 3<sup>d</sup>,* If the Place be neither in the same Latitude nor Longitude with the Ship, then take the Difference of Latitude between them in Degrees, from the Equinoctial-line, and laying a Ruler from the Ship to the Place, apply one Foot of the Compasses so to the Edge of the Ruler, that the other Foot turn'd about may just touch some East and West Line, that is cross'd by the Ruler, then take the Distance along the Edge of the Ruler, from the Place where the Compasses rested, to the Place where the Ruler crosses the said East and West Line; that Distance measured on the Equinoctial, or Degrees of Longitude, will give the Distance in Degrees, which you may turn into Miles or Leagues, and in the same manner as you find the Bearing and Distance of any Place from the Ship; you may also find the Bearing and Distance of one Place from another.

F I N I S.



